Monthly water situation report

England

Summary – January 2018

January's rainfall was above average across England at 112% of the monthly long term average. Monthly rainfall totals were classed as normal or higher for the time of year across all hydrological areas. Soil moisture deficits decreased across England during January or remained at zero. Monthly mean river flows increased compared to December at all but two indicator sites and were normal or higher for the time of year at all but one site. Groundwater levels increased at all but 4 indicator sites during January, although end of the month levels remained below normal or lower for the time of year at just over a third of the sites. Reservoir stocks increased or remained unchanged at all reported reservoirs and reservoir groups, with notable increases of more than 20% occurring at 5 reservoirs. At the end of January, stocks were normal or higher for the time of year at all but 6 sites, whilst overall storage for England increased to 93% of total capacity.

Rainfall

January rainfall totals were highest across parts of north-west and south-west England and north Wales (in catchments which flow into England), at around 200mm. Rainfall totals were lowest across parts of east England at just under 50mm. Rainfall totals were at or above the January long term average (LTA) in nearly three-quarters of hydrological areas, with parts of Yorkshire, Kent, Cornwall and Greater Manchester/Merseyside receiving 135 to 150% of the LTA. In contrast, parts of Devon, Dorset, Sussex and the Yorkshire coast received between 85 and 90% of the LTA (Figure 1.1).

January rainfall totals were classed as normal or higher for the time of year across all hydrological areas. The 3, 6 and 12 month cumulative rainfall totals were also normal across the majority of hydrological areas. However the 6 and 12 month cumulative totals were below normal across some parts of north-east, central, south-east and south-west England (Figure 1.2).

At a regional scale, January rainfall totals were above average across all geographic regions, ranging from 106% of the January LTA in east England to 128% in north-west England. Rainfall totals were above normal for the time of year in north-west England and normal elsewhere. The monthly rainfall total for England was 112% of the 1961-90 LTA (109% of the 1981-2010 LTA) (Figure 1.3).

Soil moisture deficit

January's rainfall resulted in a continued decrease in soil moisture deficits (SMD) where they were still present at the start of the year. At the end of January, soil moisture deficits were at, or close to, zero across much of England, although deficits of up to approximately 30mm persisted in parts of east and south-east England. End of January SMDs were average for the time of year across most of England (Figure 2.1). At a regional scale, end of month SMDs ranged from zero in north-west and south-west England to 9mm in east England. SMDs were smaller than average across all regions (Figure 2.2).

River flows

Monthly mean river flows for January increased at all but 2 indicator sites compared to December and were classed as normal or higher for the time of year at all but one site. Flows on the groundwater-fed River Ver, in the Chilterns in south-east England, remained notably low (Figure 3.1). At the regional index sites, monthly mean river flows were above normal for the time of year on the River Exe in Devon, in south-west England, and normal elsewhere (Figure 3.2).

Groundwater levels

Groundwater levels increased at all but 4 indicator sites during January, with the sites where levels decreased all being located within slower responding sandstone aquifers. End of month groundwater levels remained below normal or lower for the time of year at just over a third of sites, most of which are located in the chalk aquifers of south-east England. The level at Little Bucket borehole (East Kent Stour chalk) started to rise in mid-January for the first time since it went dry at the end of October 2017. The level at Woodleys No. 1 (Otter Valley sandstone aquifer) in south-west England remained exceptionally low for the time of year for the third consecutive month (Figure 4.1).

End of month groundwater levels at three of the major aquifer index sites were lower than normal for the time of year; Stonor Park (South West Chilterns chalk aquifer) and Redlands Hall (Cam and Ely Ouse chalk aquifer) were below normal and Little Bucket was notably low. Levels at the remaining index sites were normal for the time of year, whilst Skirwith (Carlisle Basin and Eden Valley sandstone aquifer) was above normal (Figure 4.2).

Reservoir storage

Reservoir stocks increased or remained unchanged at all reported reservoirs and reservoir groups during January. Notable increases in stocks of between 20 and 24% occurred at Bewl, Bough Beech, Chew Valley and Wimbleball reservoirs and in the Lower Thames reservoir group. End of month stocks were classed as normal or higher for the time of year at all but 6 reported reservoirs and reservoir groups (Figure 5.1).

Compared with the end of December, regional reservoir stocks increased across all regions, with the largest increases occurring in south-east (17%) and south-west (15%) England. End of January stocks ranged from 87% of total capacity in east England to 97% in north-east England. Overall storage for England increased to 93% of total capacity (Figure 5.2).

Forward look

February's weather is expected to be generally cold and start fairly settled. Toward the middle of the month, this pattern is likely to be interrupted by frontal systems bringing warmer and wetter conditions before a return to settled conditions at the end of the month. For the 3-month period February-March-April, the likelihood of either above average or below average precipitation across the UK as a whole is close to climatology[1].

Projections for river flows at key sites[2]

Nearly four-fifths of the modelled sites have a greater than expected chance of cumulative river flows being normal or higher for the time of year at the end of March 2018. At the end of September 2018, almost a quarter of the modelled sites have a greater than expected chance of cumulative flows being normal or higher.

For scenario based projections of cumulative river flows at key sites by March 2018 see Figure 6.1
For scenario based projections of cumulative river flows at key sites by September 2018 see Figure 6.2
For probabilistic ensemble projections of cumulative river flows at key sites by March 2018 see Figure 6.3
For probabilistic ensemble projections of cumulative river flows at key sites by September 2018 see Figure 6.4

Projections for groundwater levels in key aquifers[2]

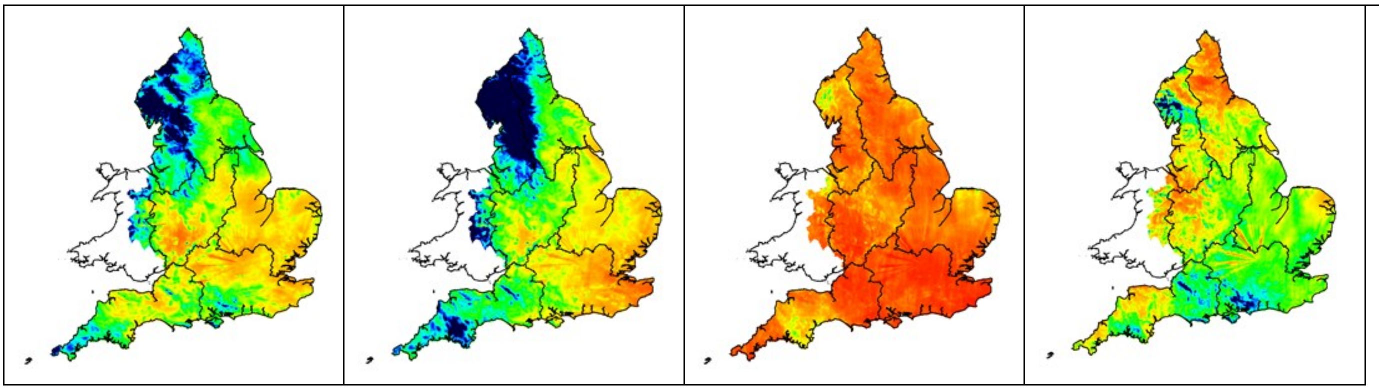
Half of the modelled sites have a greater than expected chance of groundwater levels being below normal or lower for the time of year at the end of March 2018. At the end of September 2018, just under half of the modelled sites have a greater than expected chance of levels being below normal or lower.

For scenario based projections of groundwater levels in key aquifers in March 2018 see Figure 6.5
For scenario based projections of groundwater levels in key aquifers in September 2018 see Figure 6.6
For probabilistic ensemble projections of groundwater levels in key aquifers in March 2018 see Figure 6.7
For probabilistic ensemble projections of groundwater levels in key aquifers in September 2018 see Figure 6.8

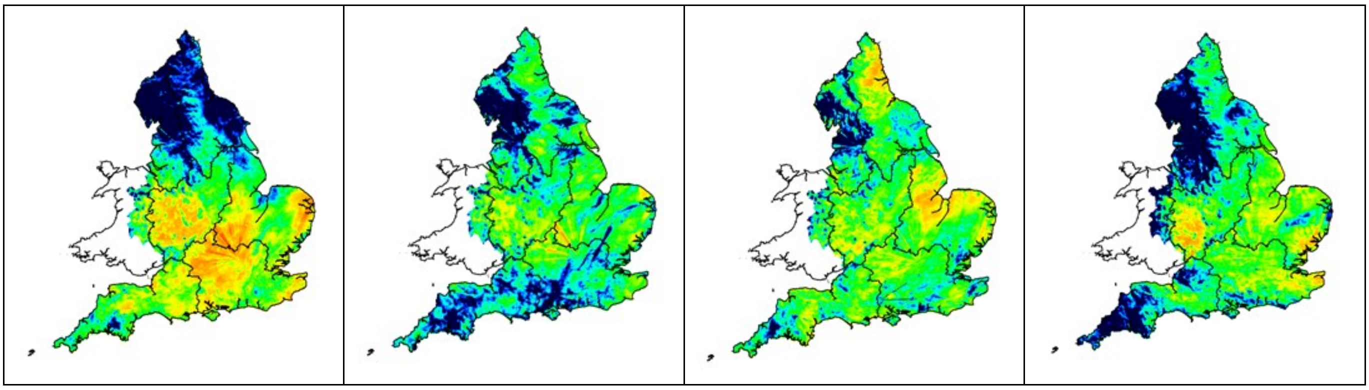
Authors: National Water Resources Hydrology Team

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).

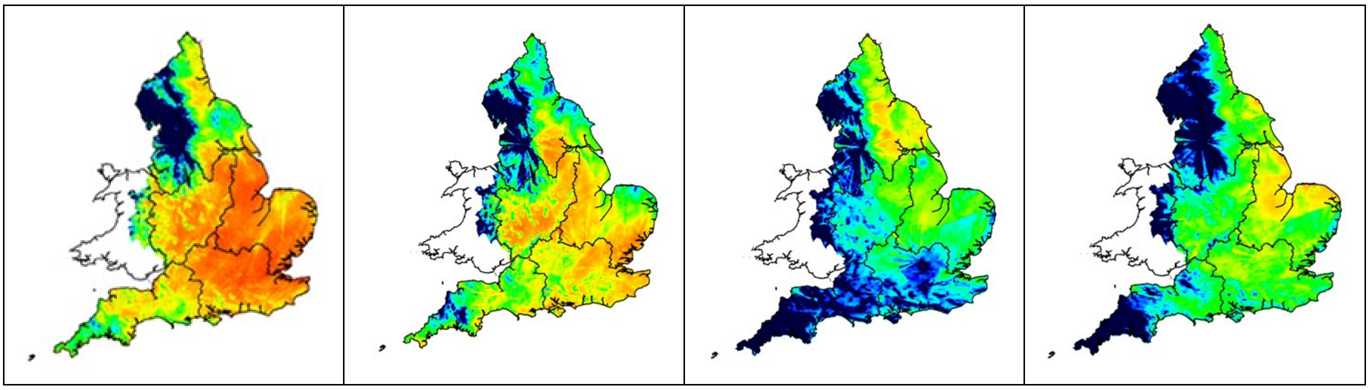
Rainfall



February 2017 | March 2017 | April 2017 | May 2017

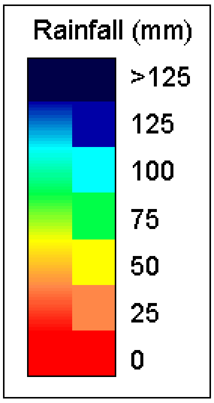


June 2017 | July 2017 | August 2017 | September 2017



October 2017 | November 2017 | December 2017 | January 2018

Figure 1.1: Monthly rainfall across England and Wales for the past 12 months. UKPP radar data (Source: Met Office © Crown Copyright, 2018). Note: Radar beam blockages in some regions may give anomalous totals in some areas.



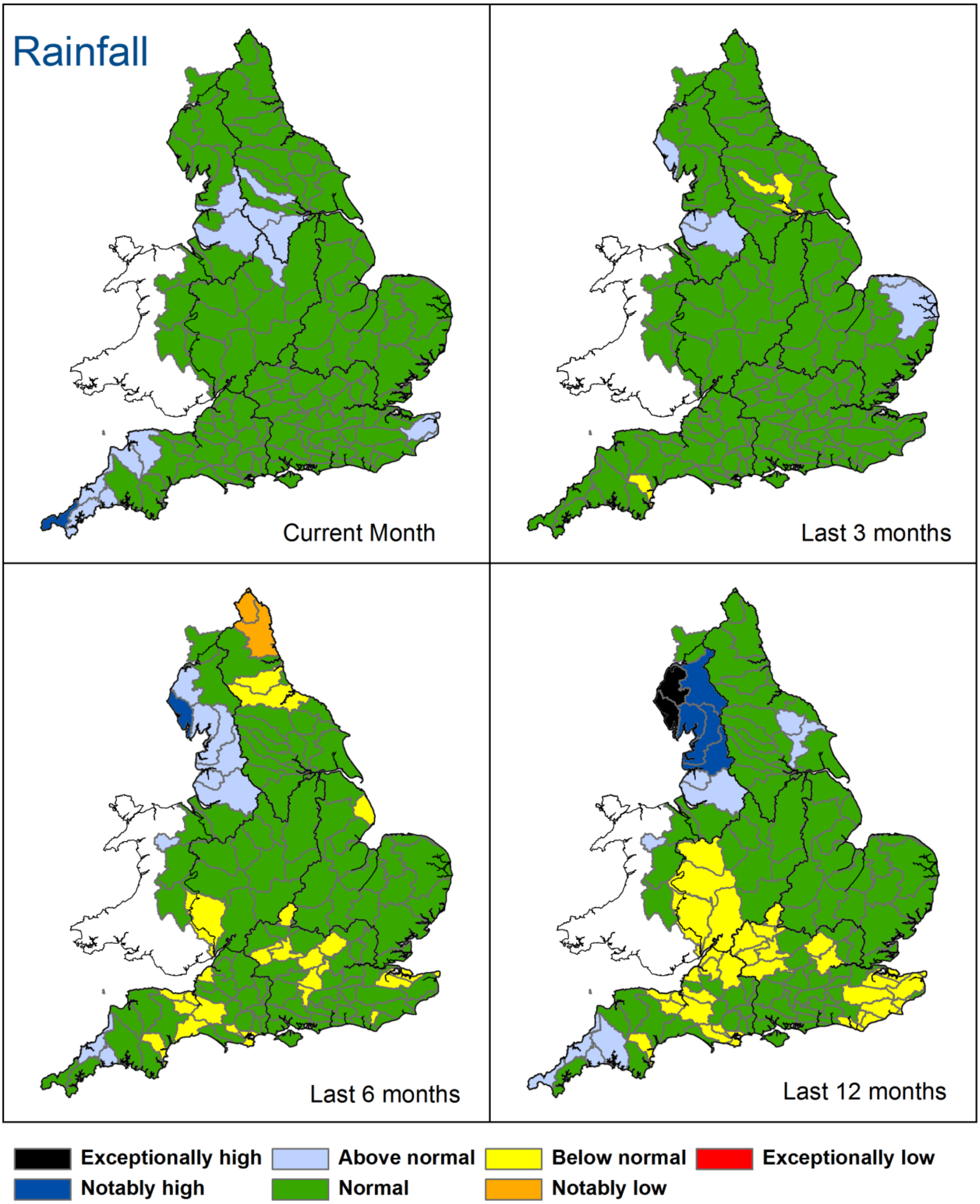


Figure 1.2: Total rainfall for hydrological areas across England for the current month (up to 31 January), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. Final NCIC (National Climate Information Centre) data based on the Met Office 5km gridded rainfall dataset derived from rain gauges *(Source: Met Office © Crown Copyright, 2018).* Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved. Environment Agency, 100026380, 2018.

Rainfall charts

Above average rainfall

Below average rainfall

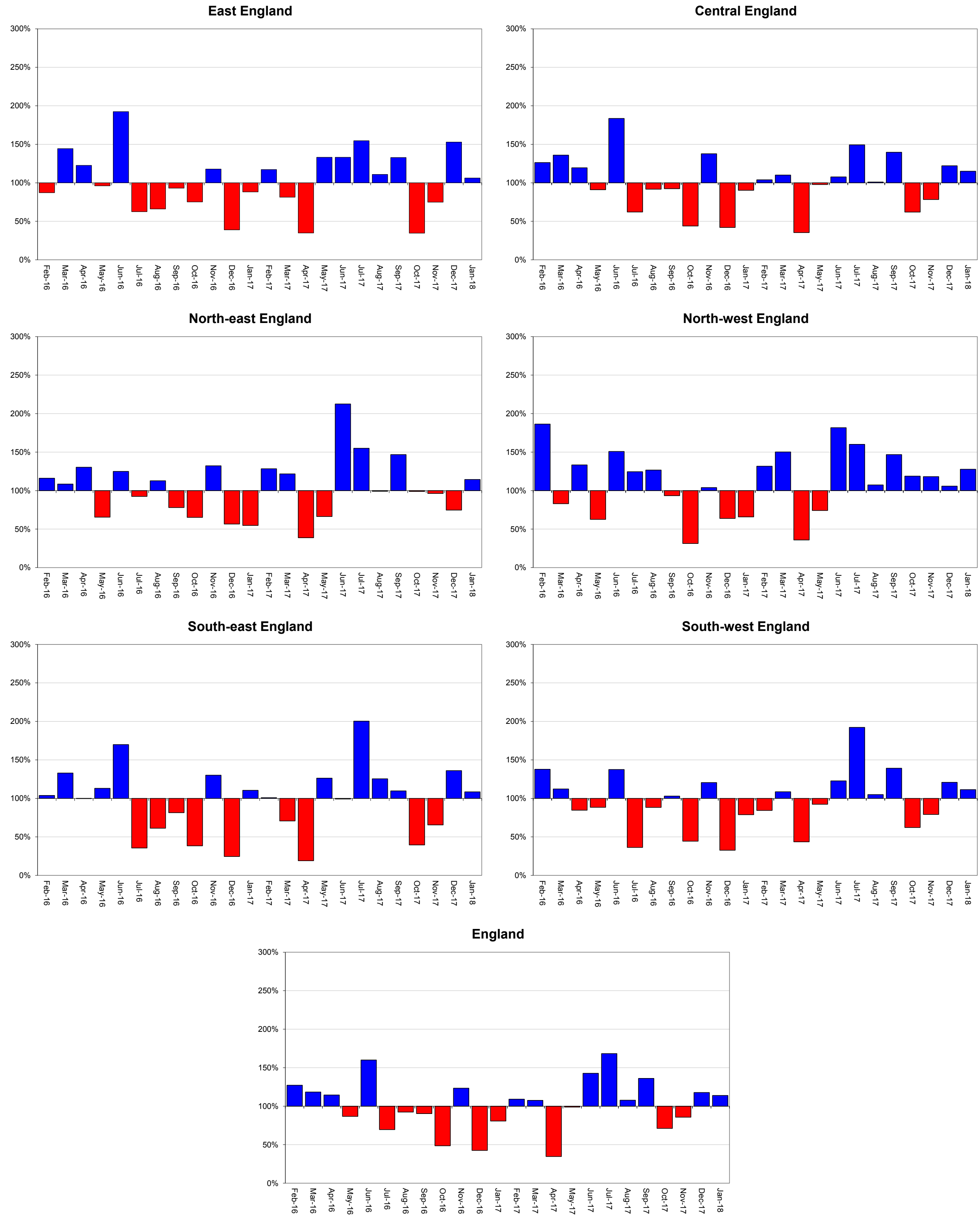


Figure 1.3: Monthly rainfall totals for the past 24 months as a percentage of the 1961 – 1990 long term average for each region and for England. NCIC (National Climate Information Centre) data. (Source: Met Office © Crown Copyright, 2018).

Soil moisture deficit

End of December 2017[1]	End of January 2018[2]

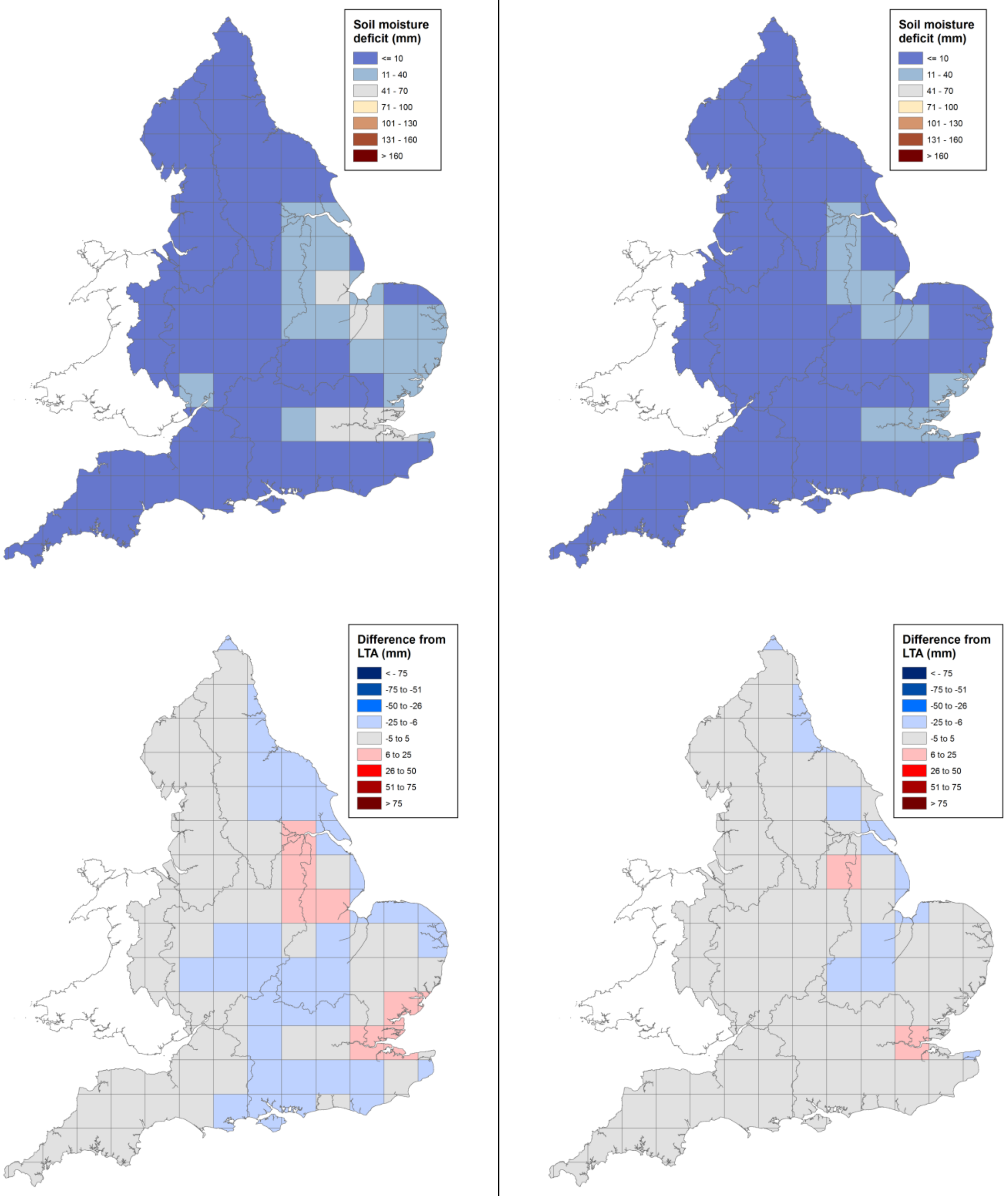


Figure 2.1: Soil moisture deficits for weeks ending 2 January 2018 [1] (left panel) and 30 January 2018 [2] (right panel). Top row shows actual soil moisture deficits (mm) and bottom row shows the difference (mm) of the actual from the 1961-90 long term average soil moisture deficits. MORECS data for real land use (Source: Met Office © Crown Copyright, 2018). Crown copyright. All rights reserved. Environment Agency, 100026380, 2018.

Soil moisture deficit charts

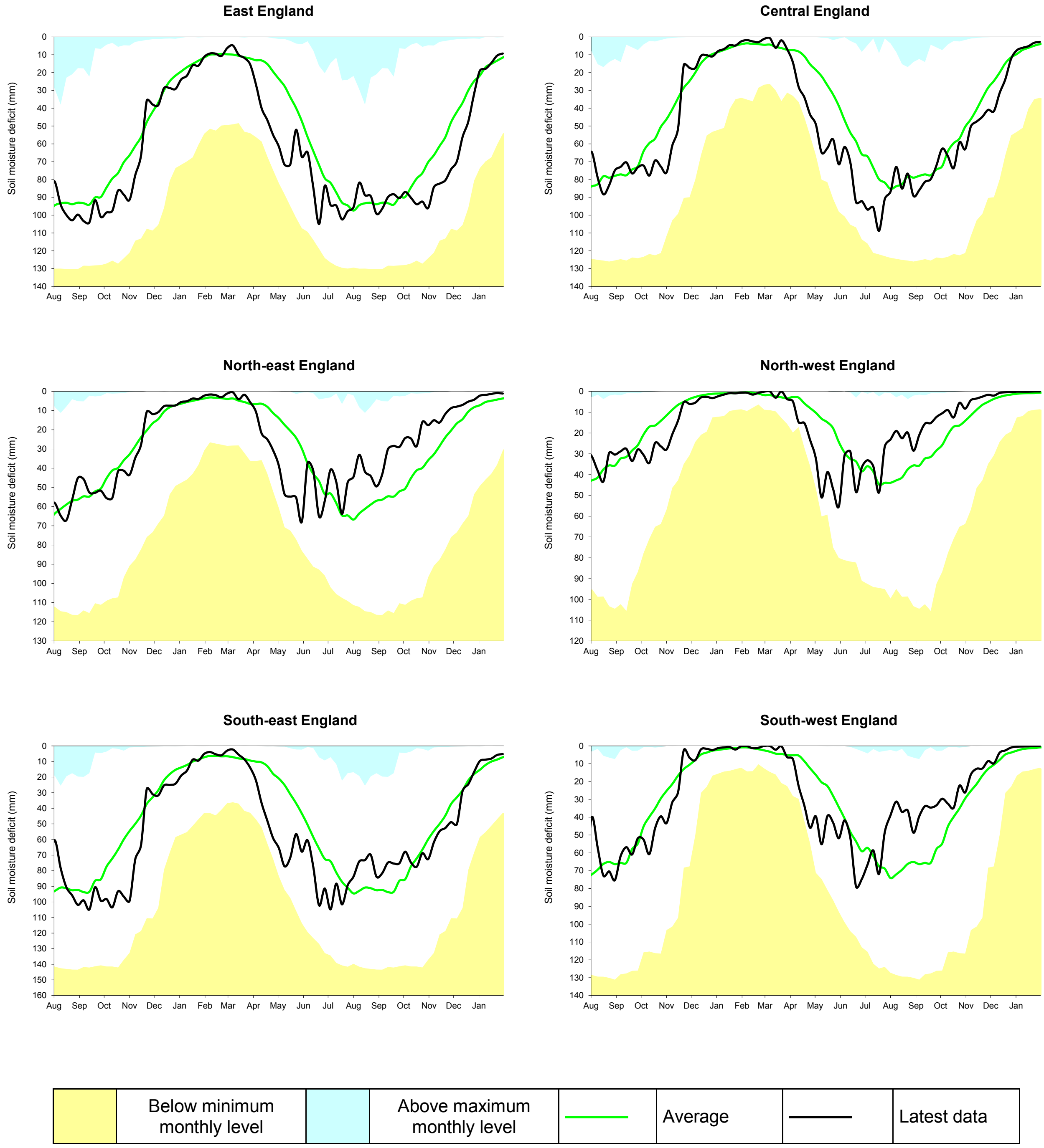
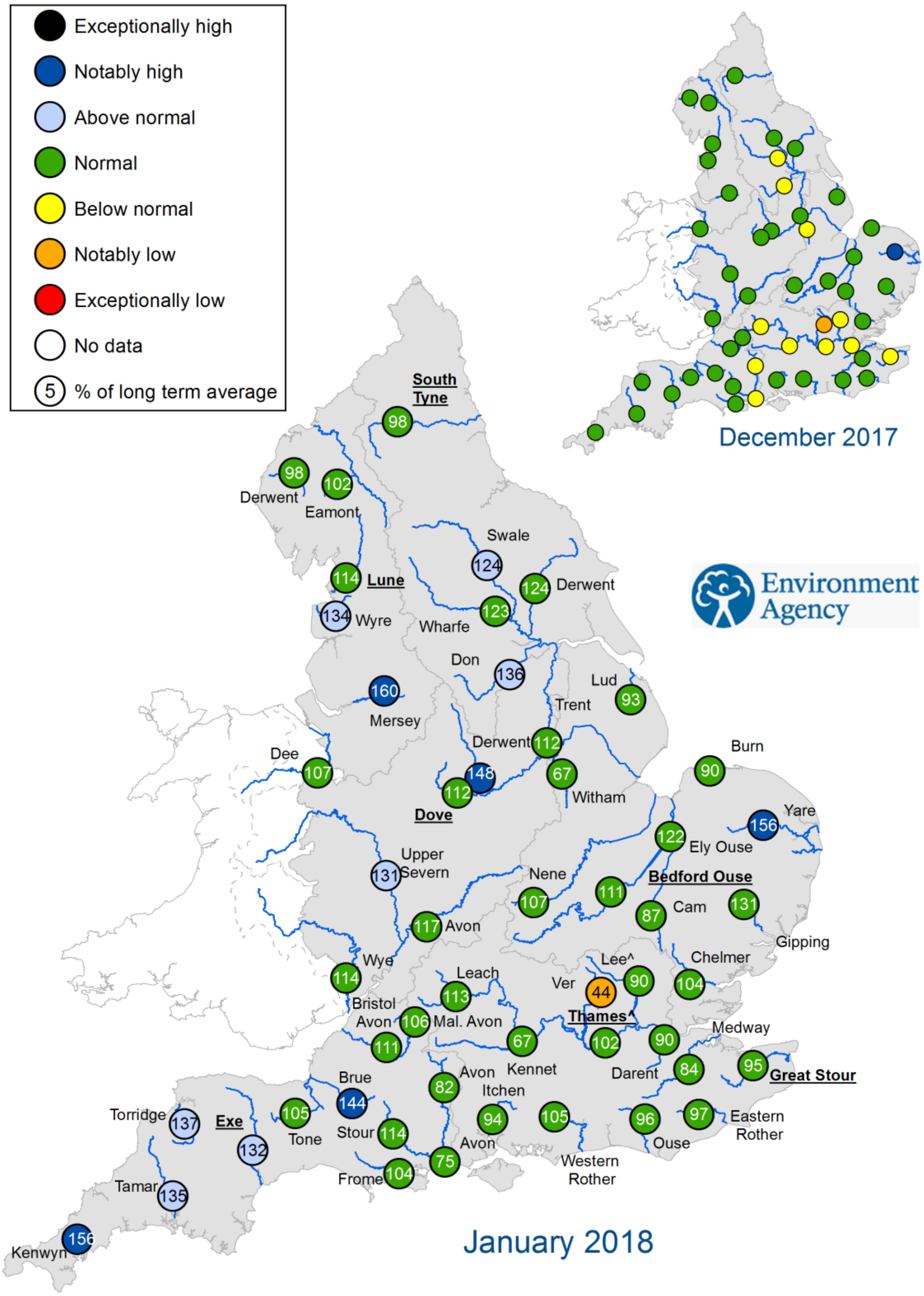


Figure 2.2: Latest soil moisture deficits for all geographic regions compared to maximum, minimum and 1961-90 long term average. Weekly MORECS data for real land use. (Source: Met Office © Crown Copyright, 2018).

River flows



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

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 2017 and January 2018, 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

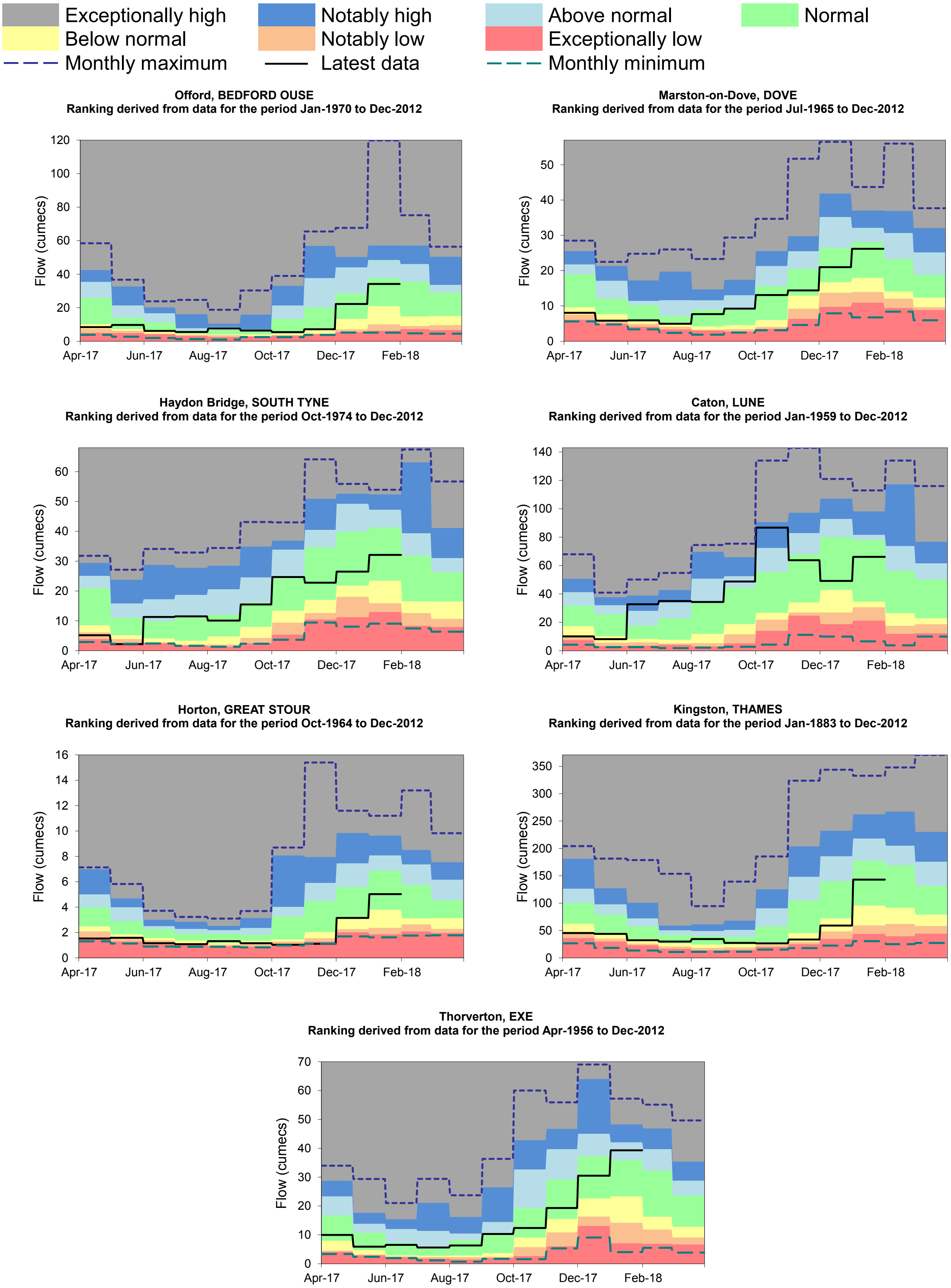
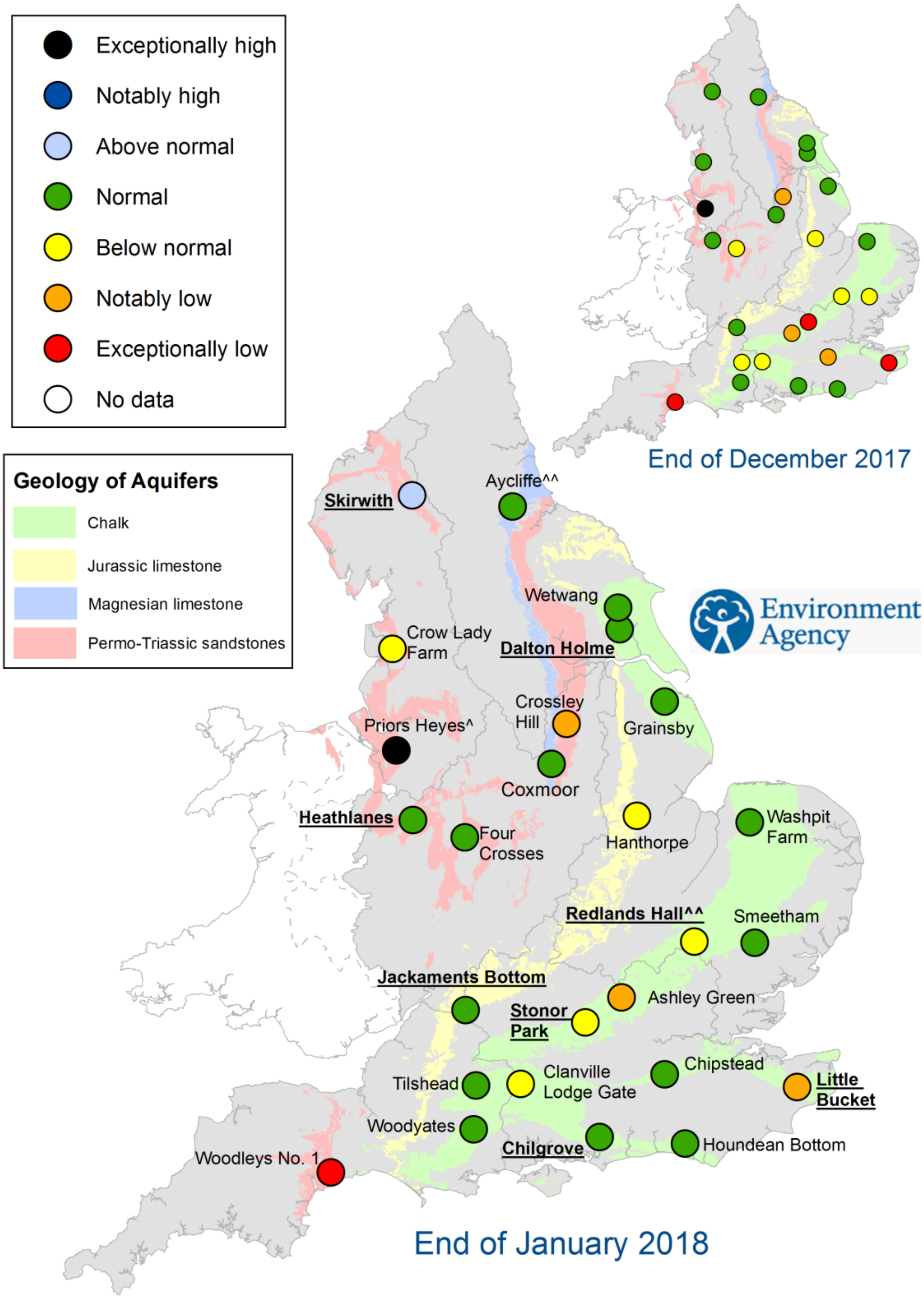


Figure 3.2: Index river flow sites for each geographic region. Monthly mean flow compared to an analysis of historic monthly mean flows, long term maximum and minimum flows. (Source: Environment Agency).

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

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 2017 and January 2018, 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, 100026380, 2018.

Groundwater level charts

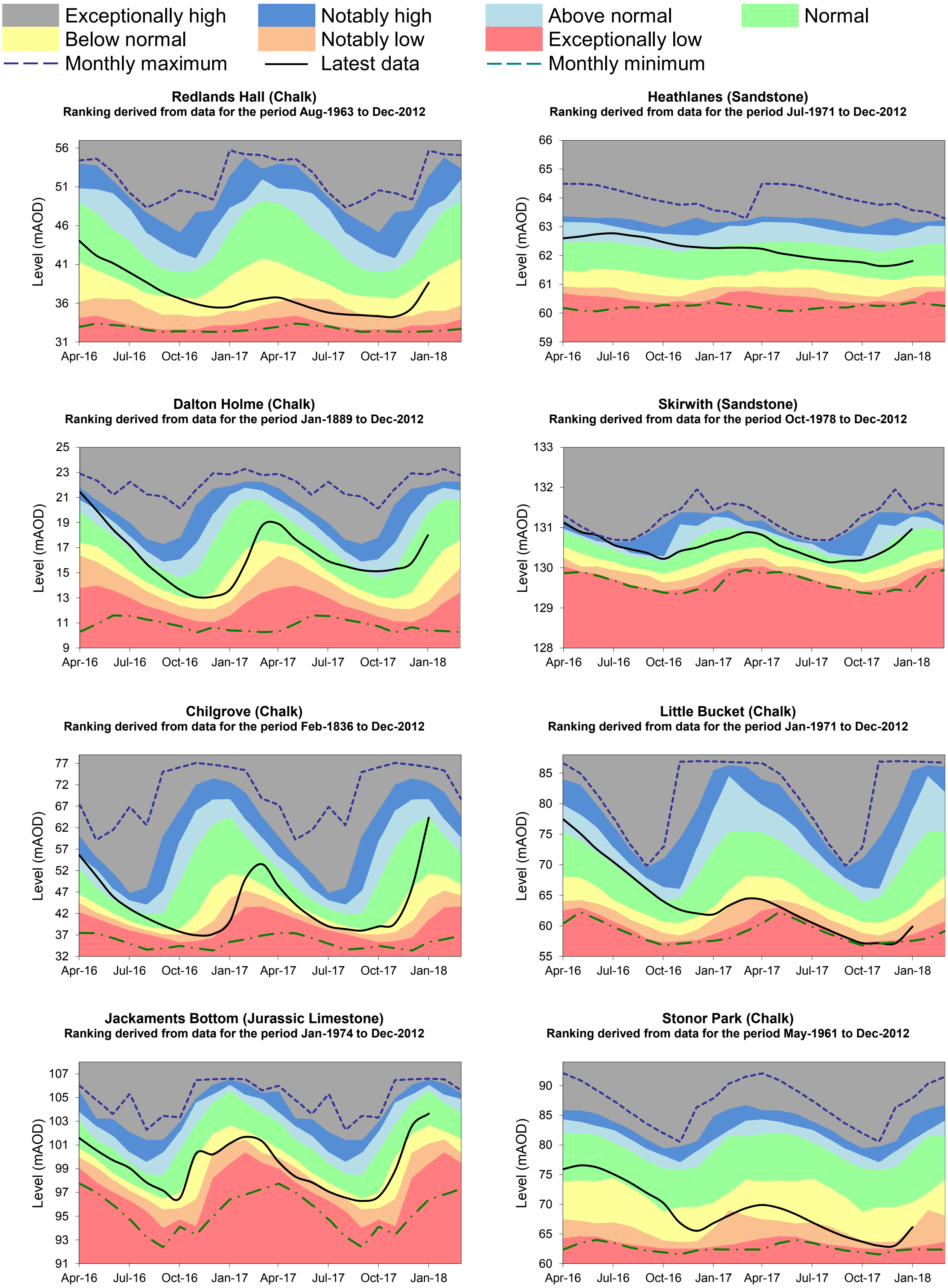
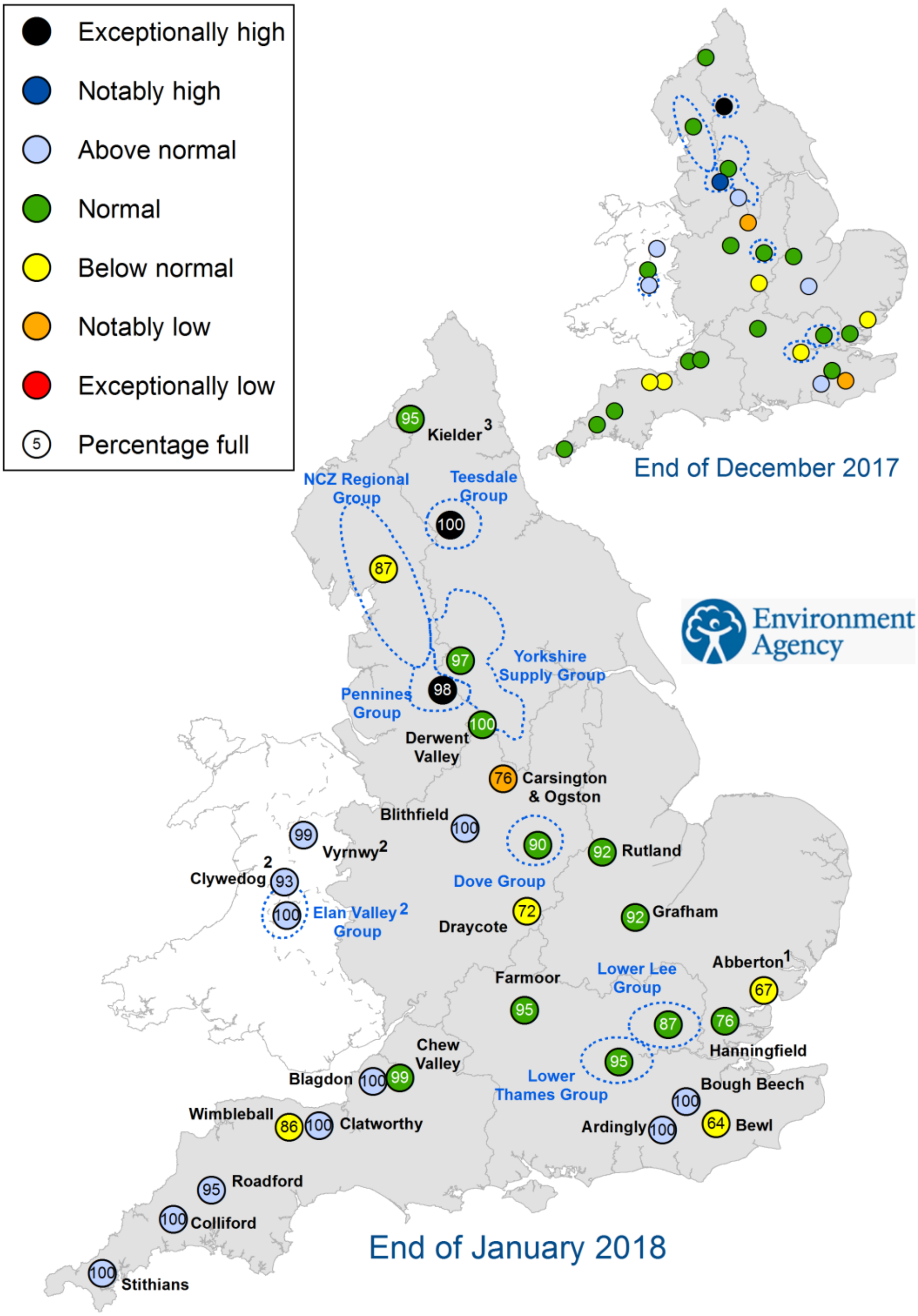


Figure 4.2: Index groundwater level sites for major aquifers. End of month groundwater levels months compared to an analysis of historic end of month levels and long term maximum and minimum levels. (Source: Environment Agency, 2018).

Reservoir storage



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

Figure 5.1: Reservoir stocks at key individual and groups of reservoirs at the end of December 2017 and January 2018 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.

Reservoir storage charts

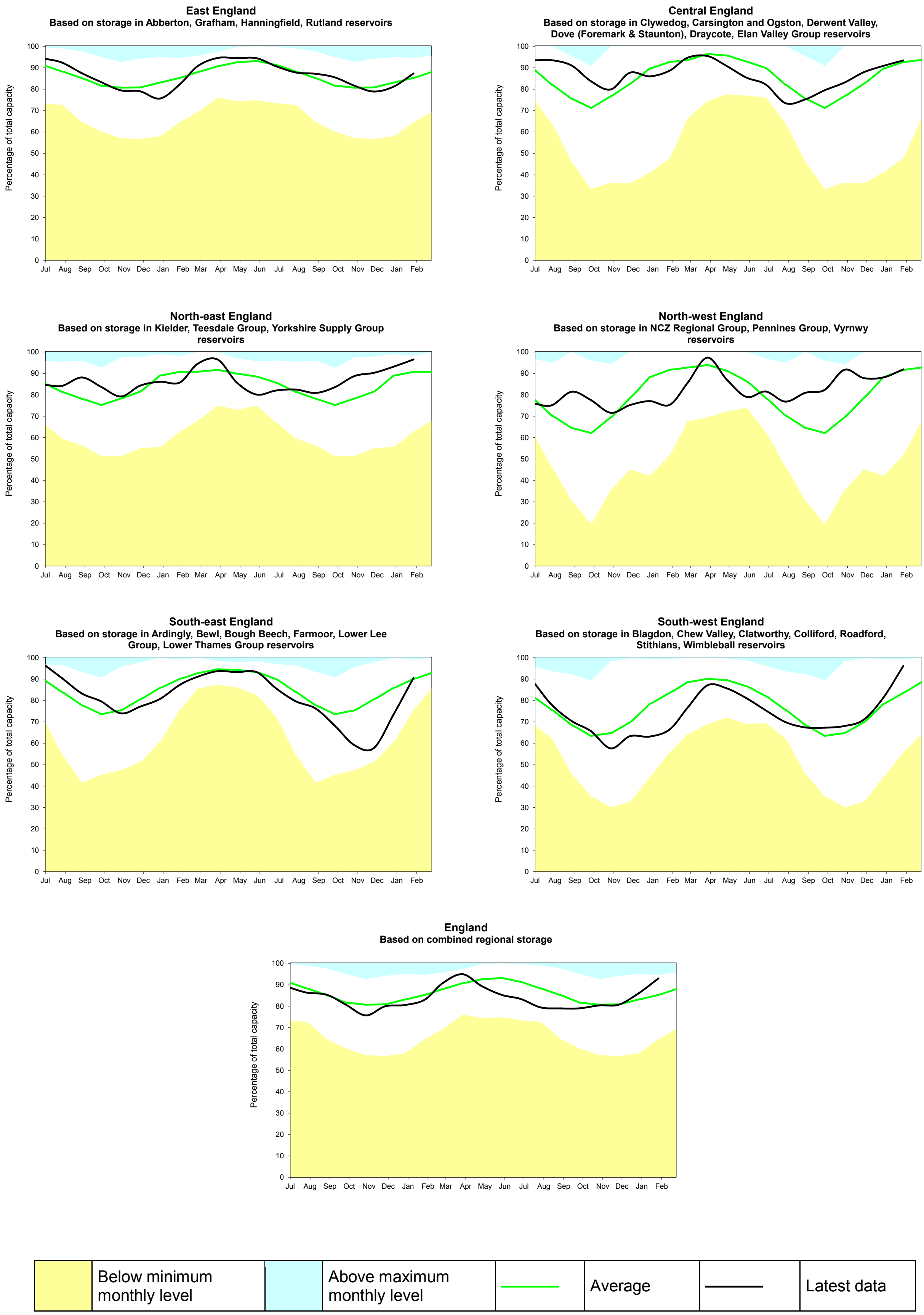


Figure 5.2: Regional reservoir stocks. End of month reservoir stocks compared to long term maximum, minimum and average stocks (Source: Water Companies). Note: Historic records of individual reservoirs/reservoir groups making up the regional values vary in length.

Forward look – river flow

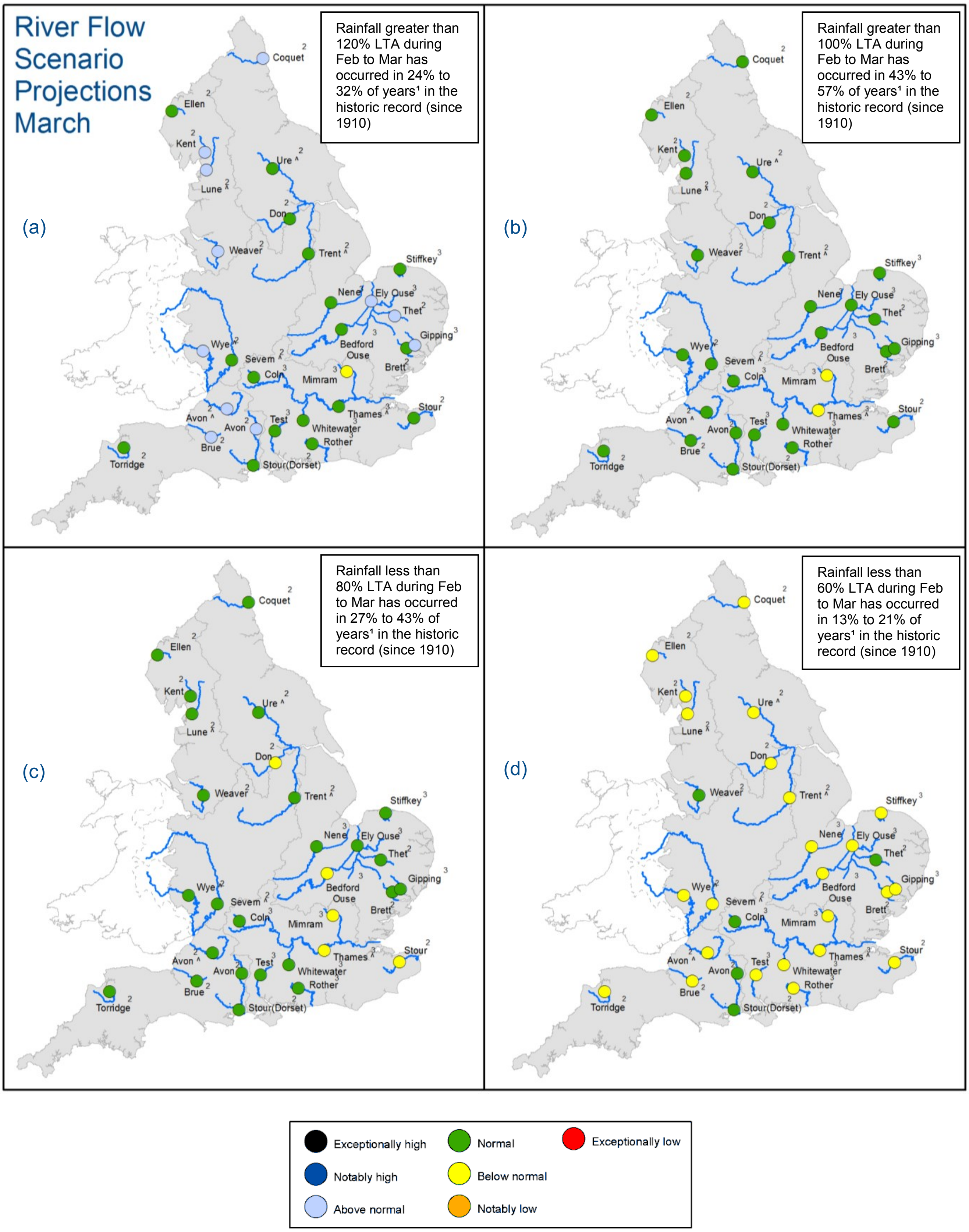


Figure 6.1: Projected river flows at key indicator sites up until the end of March 2018. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February and March 2018 (Source: Centre for Ecology and Hydrology, Environment Agency).

[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*

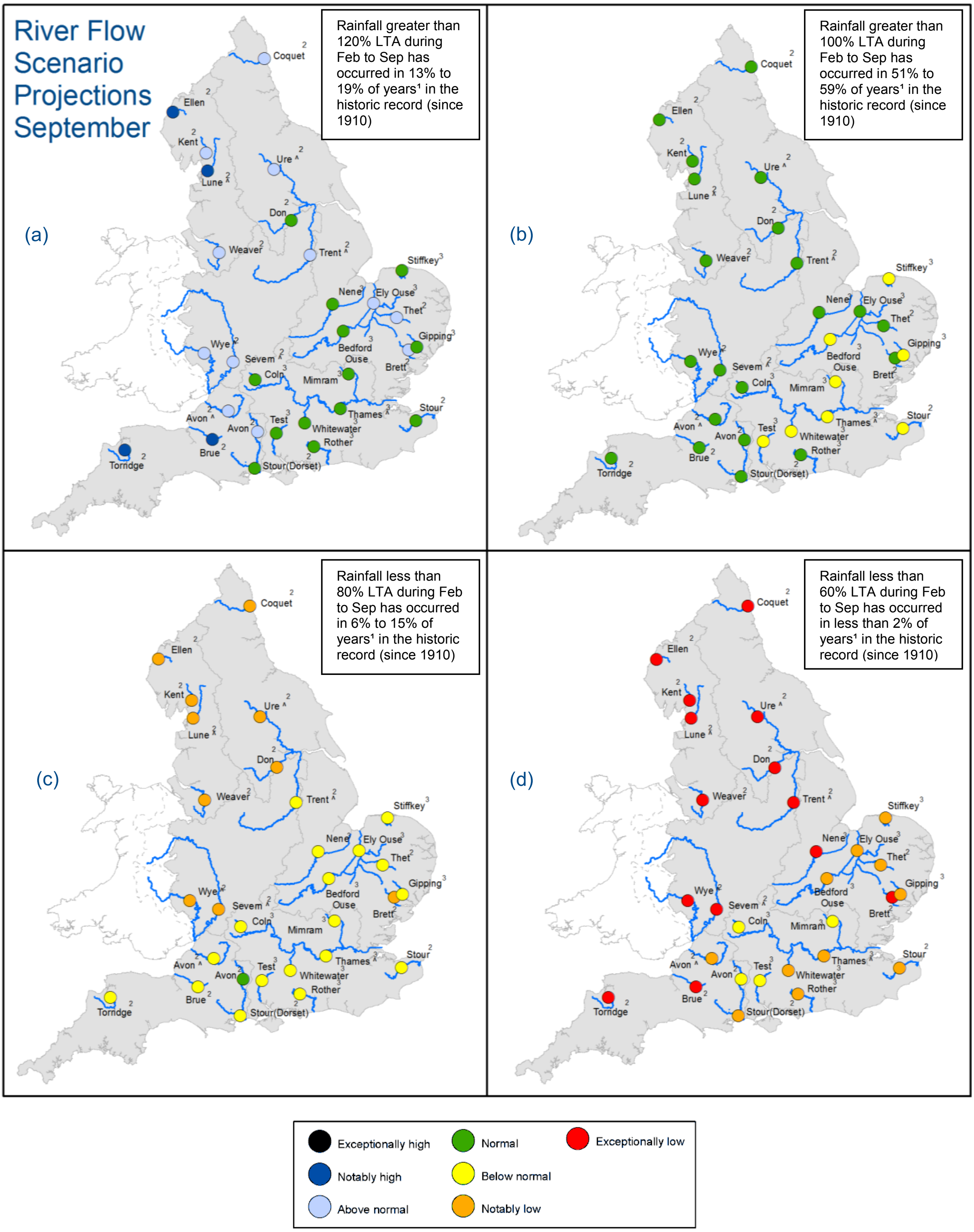


Figure 6.2: Projected river flows at key indicator sites up until the end of September 2018. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February and September 2018 (Source: Centre for Ecology and Hydrology, Environment Agency).

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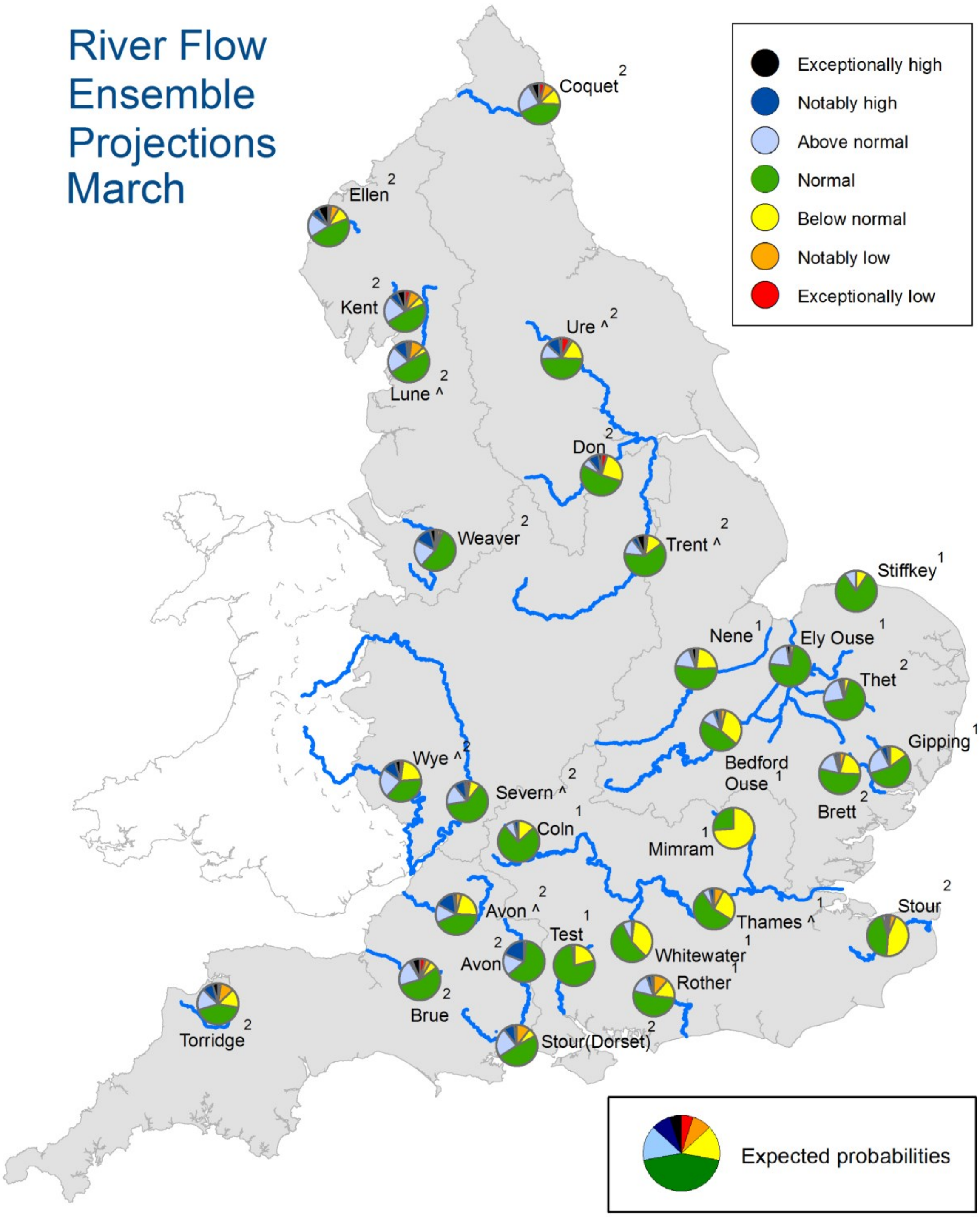

Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are 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 2018. 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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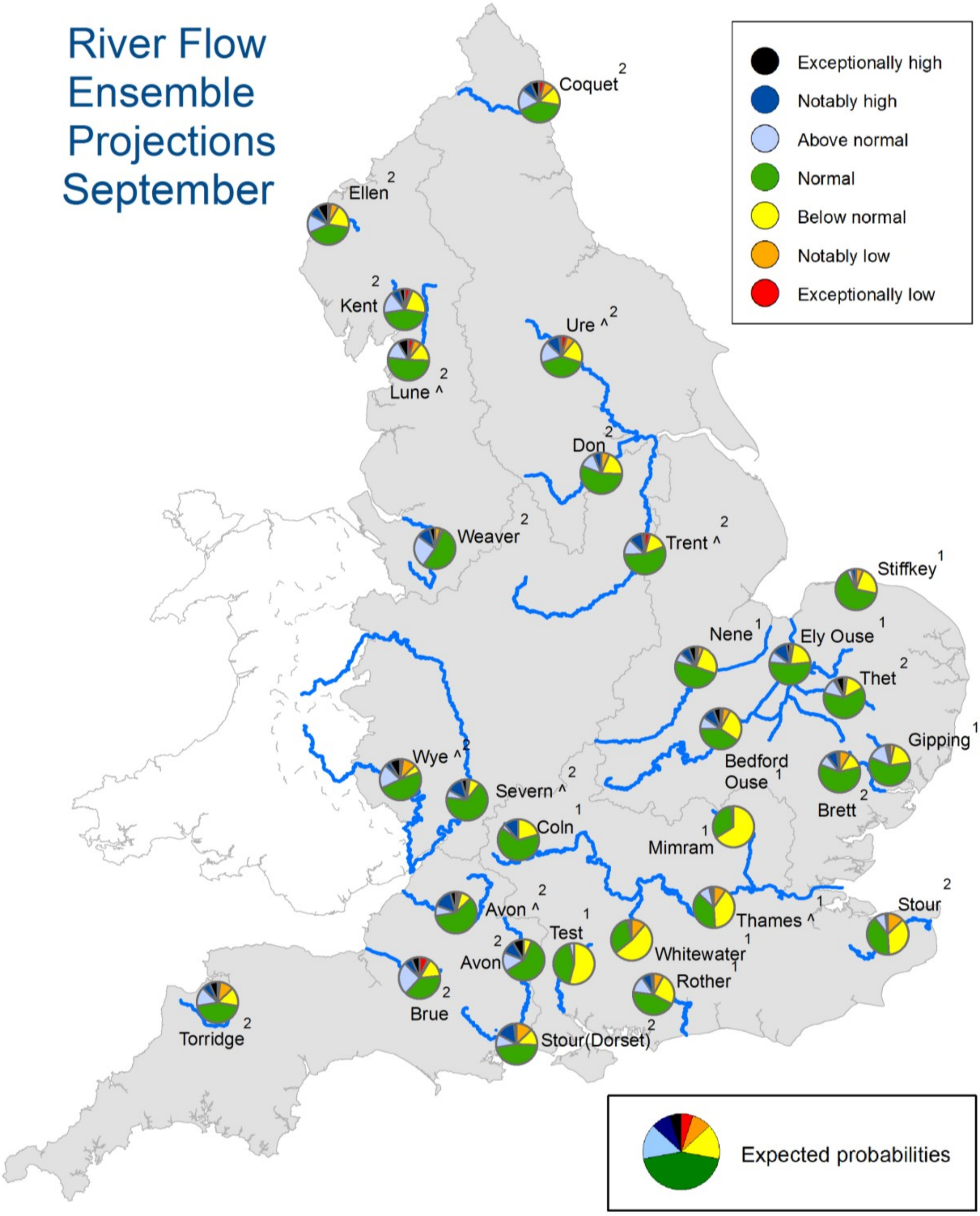


Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are 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 2018. 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

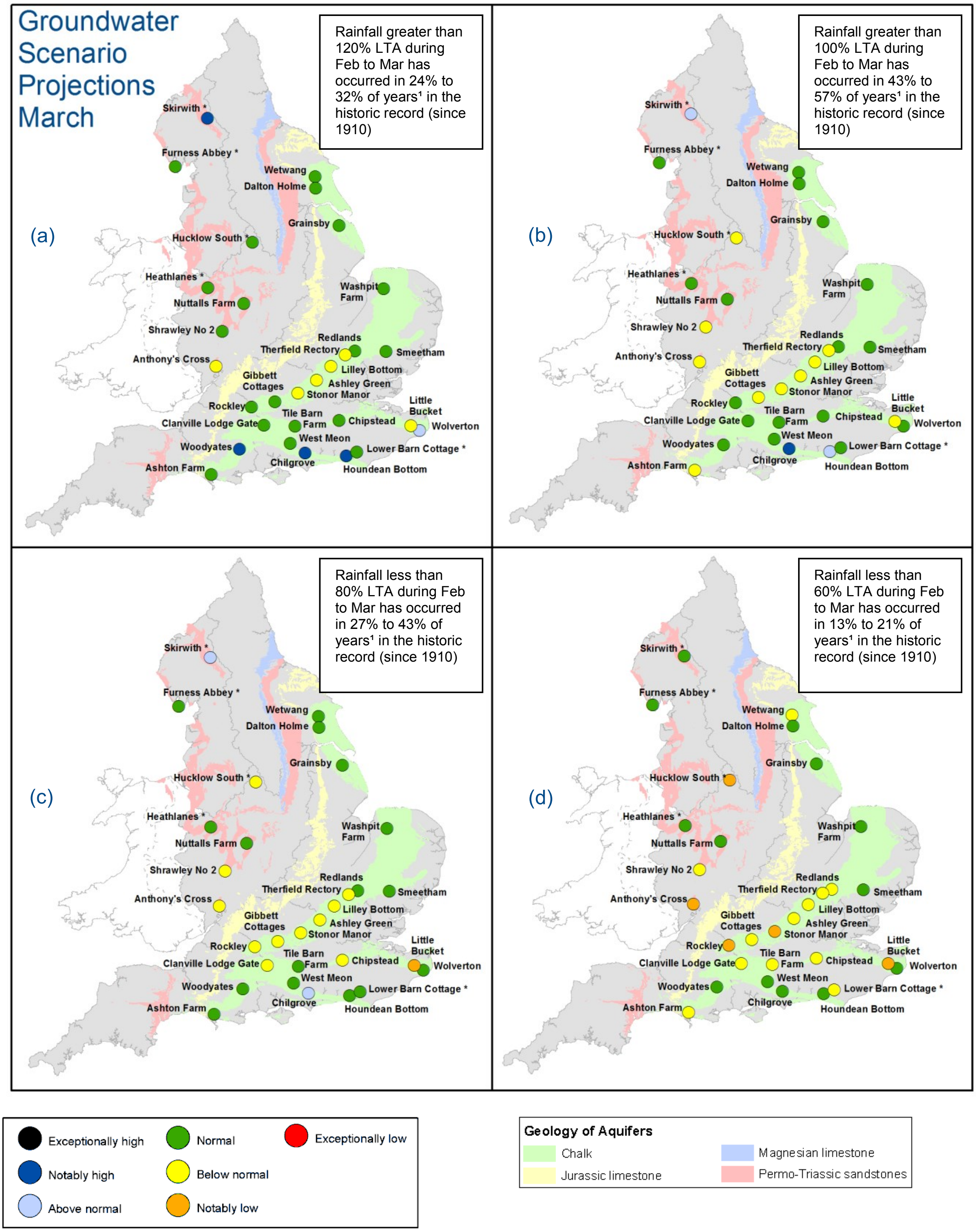


Figure 6.5: Projected groundwater levels at key indicator sites at the end of March 2018. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February and March 2018 (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC. Crown copyright all rights reserved. Environment Agency 100026380, 2018.

* Projections for these sites are produced by BGS

¹ This range of probabilities is a regional analysis

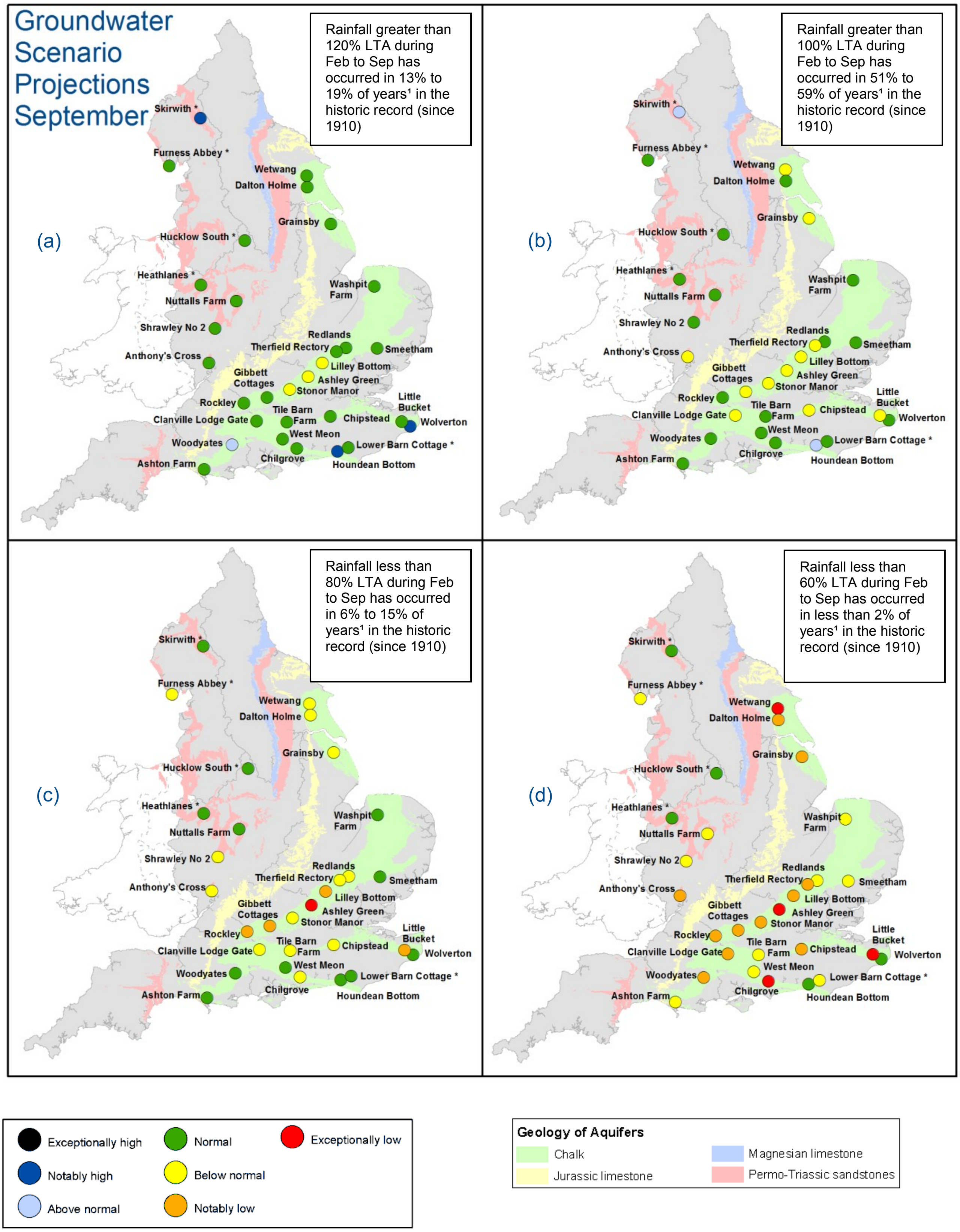
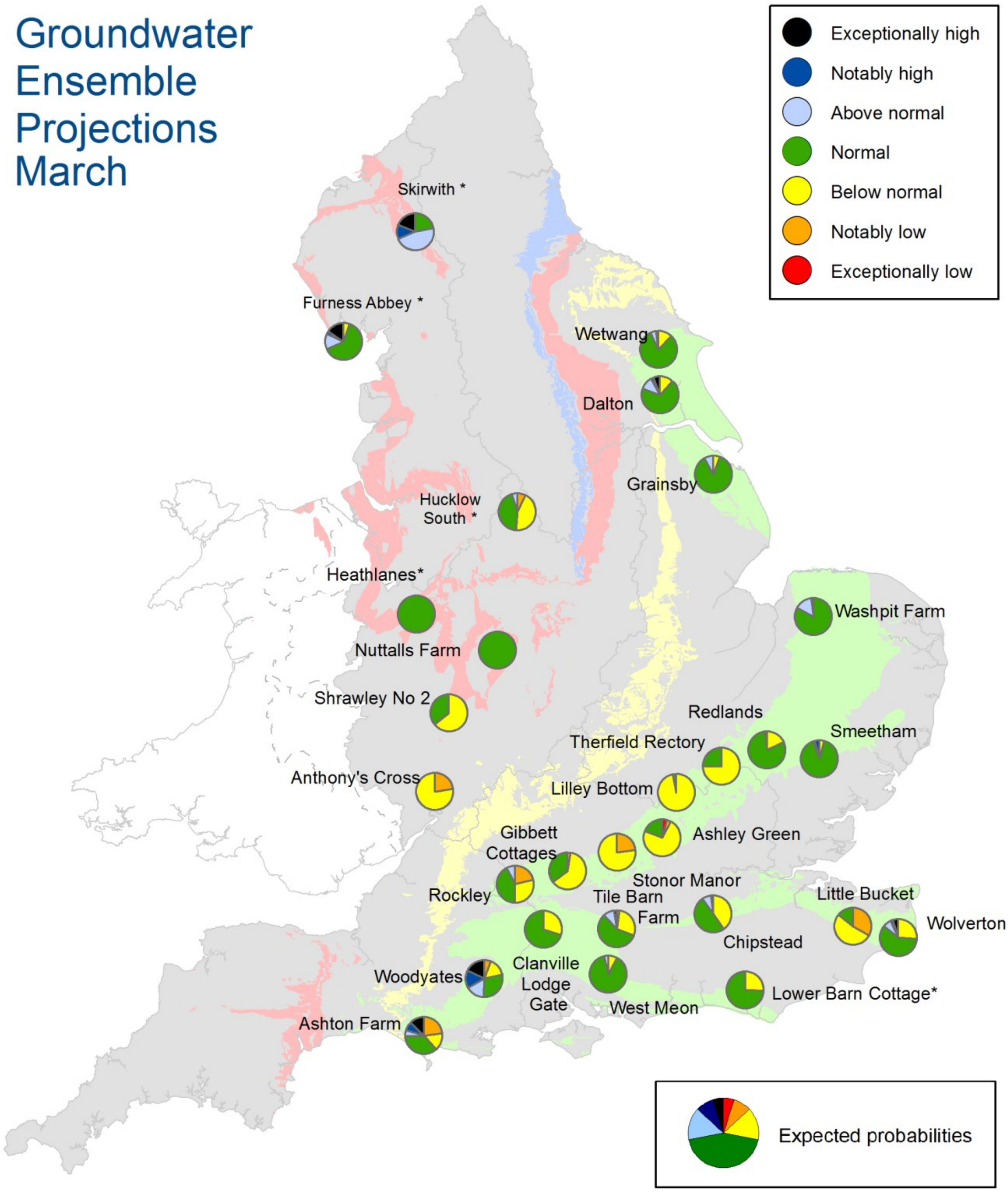


Figure 6.6: Projected groundwater levels at key indicator sites at the end of September 2018. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February and September 2018 (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC. Crown copyright. All rights reserved. Environment Agency 100026380 2018.

* 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 2018. 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, 100026380, 2018.

** Projections for these sites are produced by BGS*

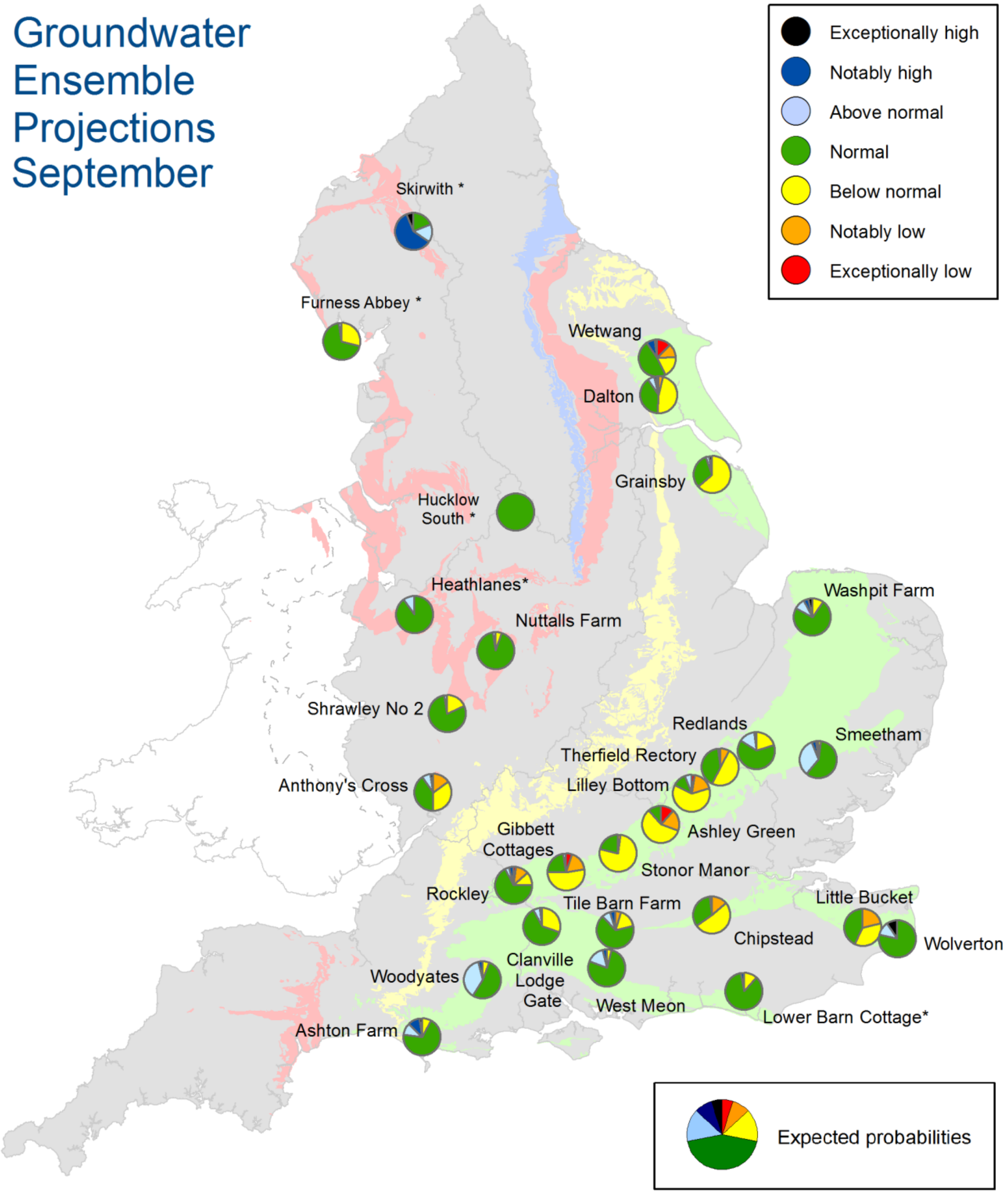


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Figure 6.8: Probabilistic ensemble projections of groundwater levels at key indicator sites at the end of September 2018. Pie charts indicate probability, based on climatology, of the groundwater level at each site being e.g. exceptionally low for 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, 100026380, 2018.

* 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 1961-1990, 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