Monthly water situation report

England

Summary – October 2018

The October rainfall total for England was below average for the sixth consecutive month, although only a third of catchments had rainfall totals that were classed as lower than normal for the time of year. Soils remained drier than average for the time of year across most of the country, with the driest soils in the east and south-east of England. Monthly mean river flows increased at three-quarters of indicator sites compared to September and groundwater levels continued to decrease at all but three indicator sites during October. Reservoir stocks decreased at three-quarters of reservoirs and reservoir groups across England. Just over half the reservoirs or reservoir groups had stocks classed as lower than normal for the time of year.

Rainfall

October rainfall totals were generally highest in parts of the north of England and lowest across parts of southeast England. The highest rainfall total was in the Cumbrian Esk catchment, with 198 mm representing 110% of the long-term average (LTA). The lowest rainfall total was in the Romney Marsh catchment, where 34 mm represented 45% of the LTA (Figure 1.1).

October rainfall totals were classed as normal for the time of year in two thirds of catchments across England and below normal across all but one of the remaining catchments. The six-month cumulative rainfall totals were classed as exceptionally low in thirty-eight catchments (mainly in Dorset, Somerset, Cheshire and Lancashire) with either below normal or notably low cumulative totals recorded in most other catchments. In 9 catchments (mainly in Dorset and Somerset) it was the driest 6 month period since 1921 and the 2nd driest on record (records since 1910) (Figure 1.2).

The October rainfall total for England was 67 mm, representing 87% of the 1961-1990 LTA (73% of the 1981-2010 LTA). The monthly rainfall total for England was below average for the sixth consecutive month. At a regional scale, the rainfall total for southwest England was classed as below normal (78% of LTA). In all other regions the rainfall totals were classed as normal for the time of year (Figure 1.3).

Soil moisture deficit

Soils got wetter during October across nearly all of England. Despite this, soil moisture deficits (SMDs) remained below average for the time of year across nearly all of the country. The driest soils were in the east and south-east of England and the wettest soils were in the north-west. Soils were much drier than average across parts of Sussex, Hampshire and Dorset (Figure 2.1)

At a regional scale, soil moisture deficits decreased across England during October (i.e. soils got wetter). (Figure 2.2)

River flows

Monthly mean river flows increased at three-quarters of indicator sites in October, compared to September. Flows were classed as normal at half the indicator sites and below normal or notably low at the rest (predominately across the southern half of England) (Figure 3.1).

At the regional index sites monthly mean flows increased but remained classed as normal for the time of year on the Bedford Ouse (east England), the South-Tyne (north-east), the River Lune (north-west) and on Naturalised flows at Kingston on the River Thames. On the River Exe (south-west) flows increased slightly but changed from being classed as normal in September to below normal in October. On the River Dove (central England) flows reduced and changed from being classed as normal in September to below normal in October. Flows on the Great Stour (south-east England) both reduced and changed from being classed as below normal in September to notably low in October (Figure 3.2)

Groundwater levels

Groundwater levels continued to decrease at all but three indicator sites during October. End of month groundwater levels were classed as normal for the time of year at half the sites and below normal or notably low at most of the rest of the indicator sites.

At the main aquifer index sites, levels were classed as below normal at Redlands Hall (Cam and Ely chalk), Jackaments Bottom (Burford Jurassic limestone) and Stonor Park (south west Chilterns chalk). Groundwater levels reduced at Chilgrove (Chicester chalk) and changed from being classed as below normal at the end of September to notably low at the end of October (Figures 4.1 and 4.2).

Reservoir storage

Reservoir stocks decreased at three-quarters of the reservoirs and reservoir groups across England during October. End of month reservoir stocks in the Dove Group were 54% of capacity and classed as exceptionally low for the time of year for the fourth month in a row (Figure 5.1). Reservoir stocks decreased by 5% or more at a quarter of reported sites – mainly in southern England.

Reservoir stocks in the NCZ Regional Group of reservoirs increased by 11% of total capacity and there was a 16% increase in the Elan Valley reservoir group (located in Wales but supplies water to England). At just under half of reservoirs or reservoir groups stocks were classed as normal for the time of year, with nearly all the remaining reservoirs and reservoir groups fairly evenly split between being classed as below normal and notably low.

Regional reservoir stocks decreased in south west, south east and east England but increased elsewhere. Total reservoir storage for England was largely unchanged at 64% of capacity at the end of October (Figure 5.2)

Forward look

After a wet and windy start to November for most of the country conditions will become drier and milder. Towards the end of November temperatures are likely drop back closer to average and it may become more unsettled with longer spells of rain. For the 3-month period November-December-January, above average precipitation is more likely than below average precipitation[1].

Projections for river flows at key sites[2]

All of the modelled sites have a greater than expected chance of cumulative river flows being below normal or lower for the time of year by the end of both March and September 2019.

For scenario based projections of cumulative river flows at key sites by March 2019 see Figure 6.1
For scenario based projections of cumulative river flows at key sites by September 2019 see Figure 6.2
For probabilistic ensemble projections of cumulative river flows at key sites by March 2019 see Figure 6.3
For probabilistic ensemble projections of cumulative river flows at key sites by September 2019 see Figure 6.4

Projections for groundwater levels in key aquifers[2]

Approximately three-quarters 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 both March and September 2019.

For scenario based projections of groundwater levels in key aquifers in March 2019 see Figure 6.5
For scenario based projections of groundwater levels in key aquifers in September 2019 see Figure 6.6
For probabilistic ensemble projections of groundwater levels in key aquifers in March 2019 see Figure 6.7
For probabilistic ensemble projections of groundwater levels in key aquifers in September 2019 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

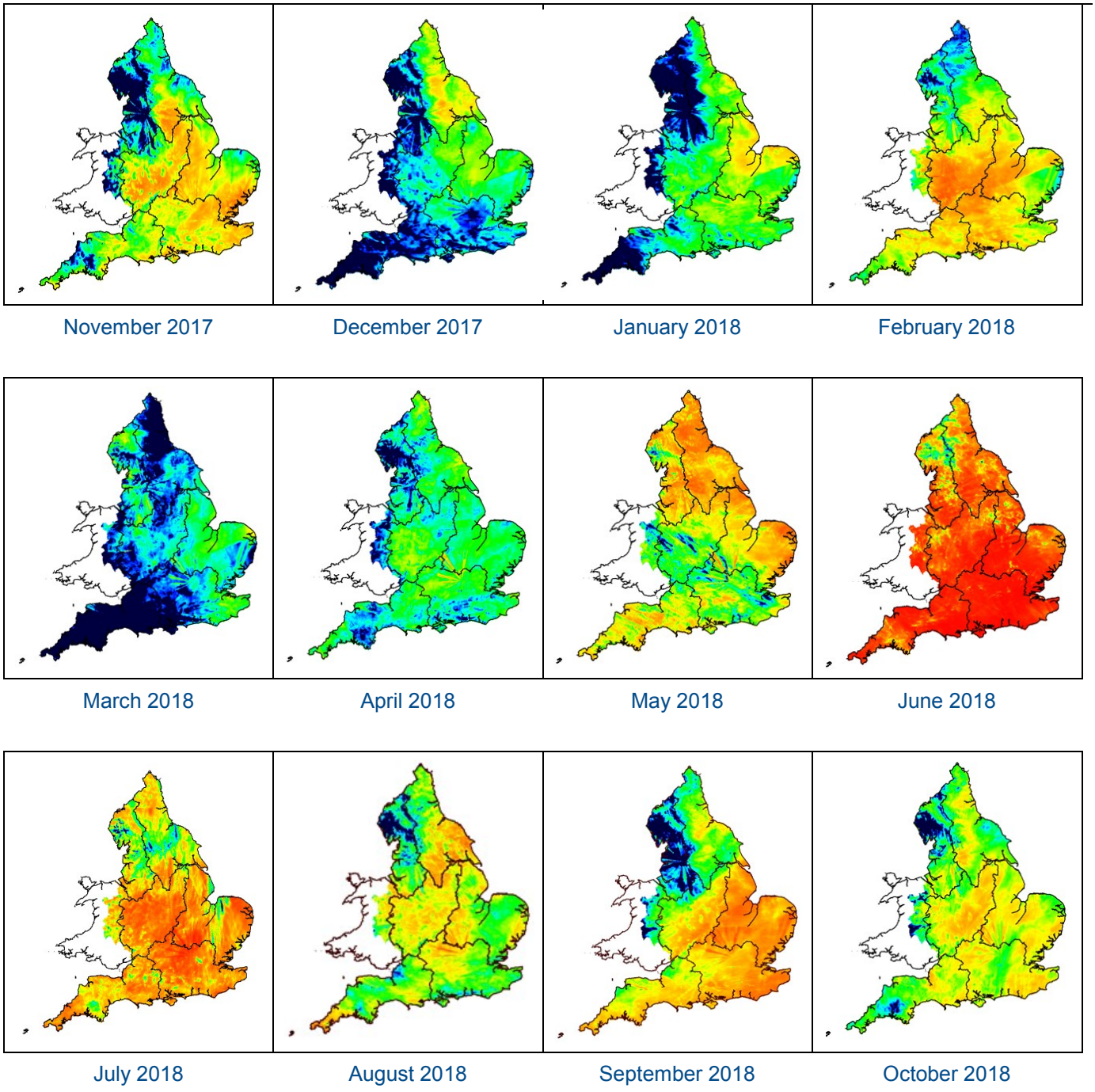


Figure 1.1: Monthly rainfall across England and Wales for the past 12 months. UKPP radar data (Source: Met Office © Crown Copyright, 2018). Note: Radar beam blockages in some regions may give anomalous totals in some areas. Crown copyright. All rights reserved. Environment Agency, 100026380, 2018.

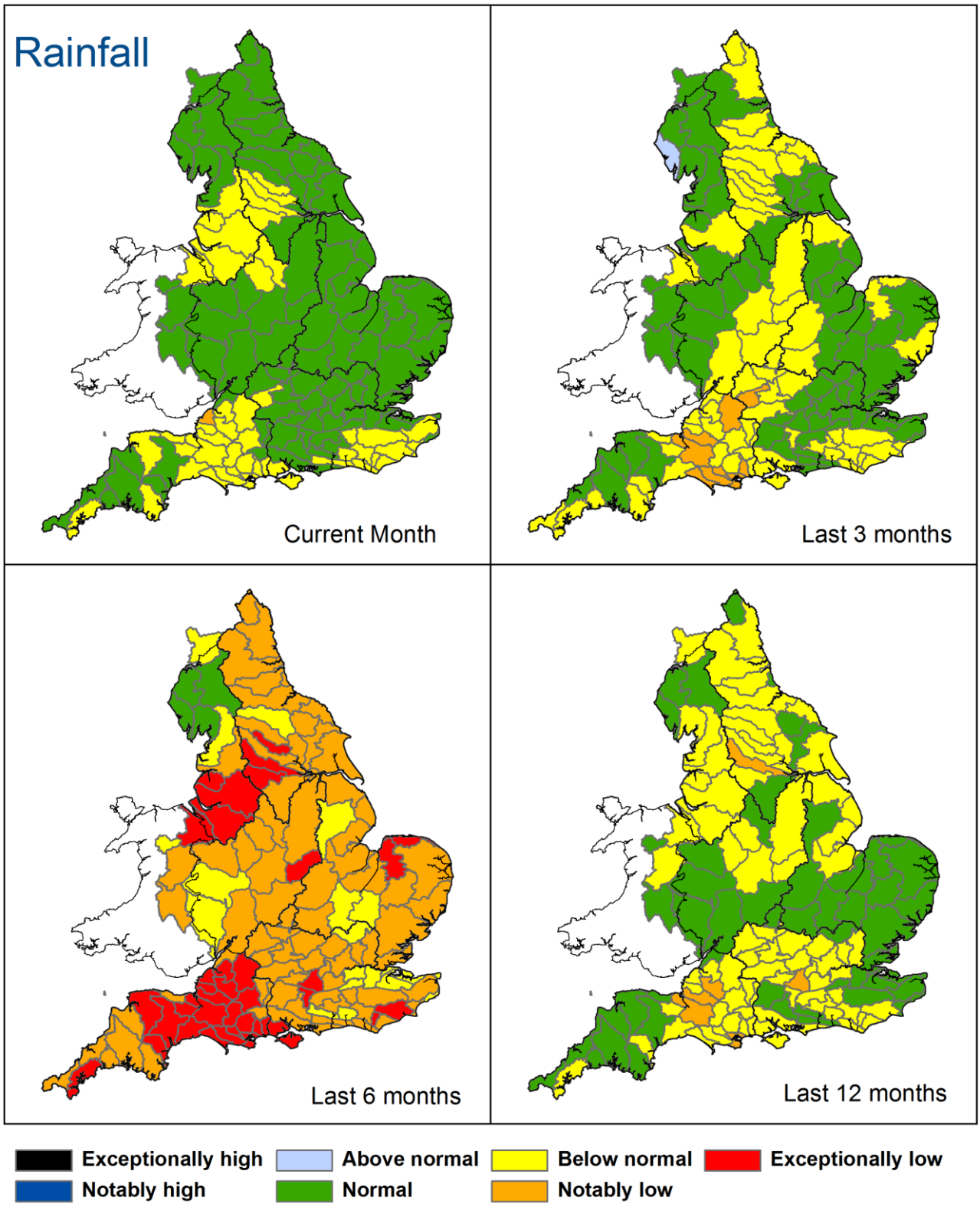


Figure 1.2: Total rainfall for hydrological areas across England for the current month (up to 31 October), the last 3 months, the last 6months, and the last 12 months, classed relative to an analysis of respective historic totals. Final NCIC (National Climate Information Centre) data based on the Met 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

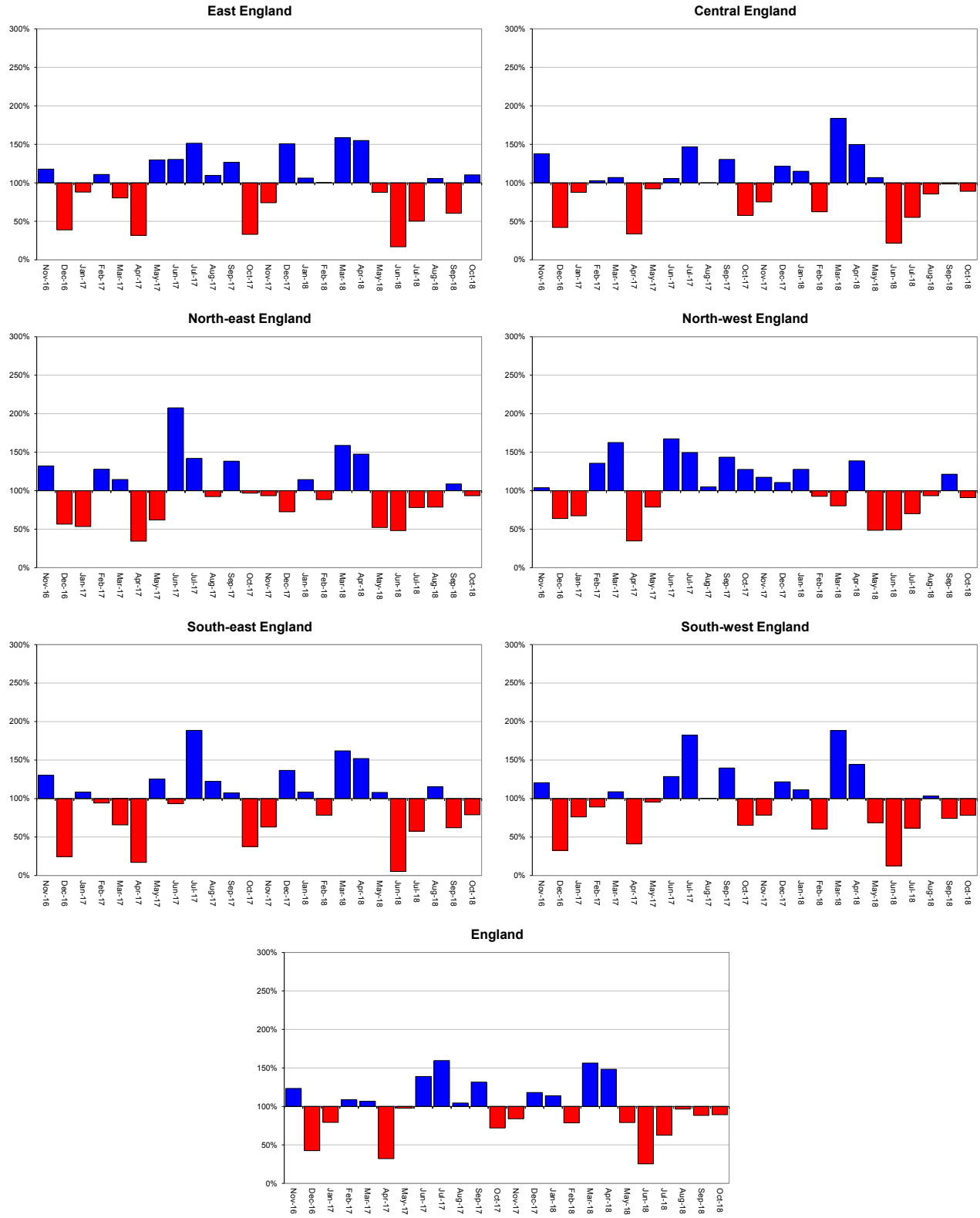


Figure 1.3: Monthly rainfall totals for the past 24 months as a percentage of the 1961 – 1990 long term average for each region and for England. NCIC (National Climate Information Centre) data. (Source: Met Office © Crown Copyright, 2018).

Soil moisture deficit

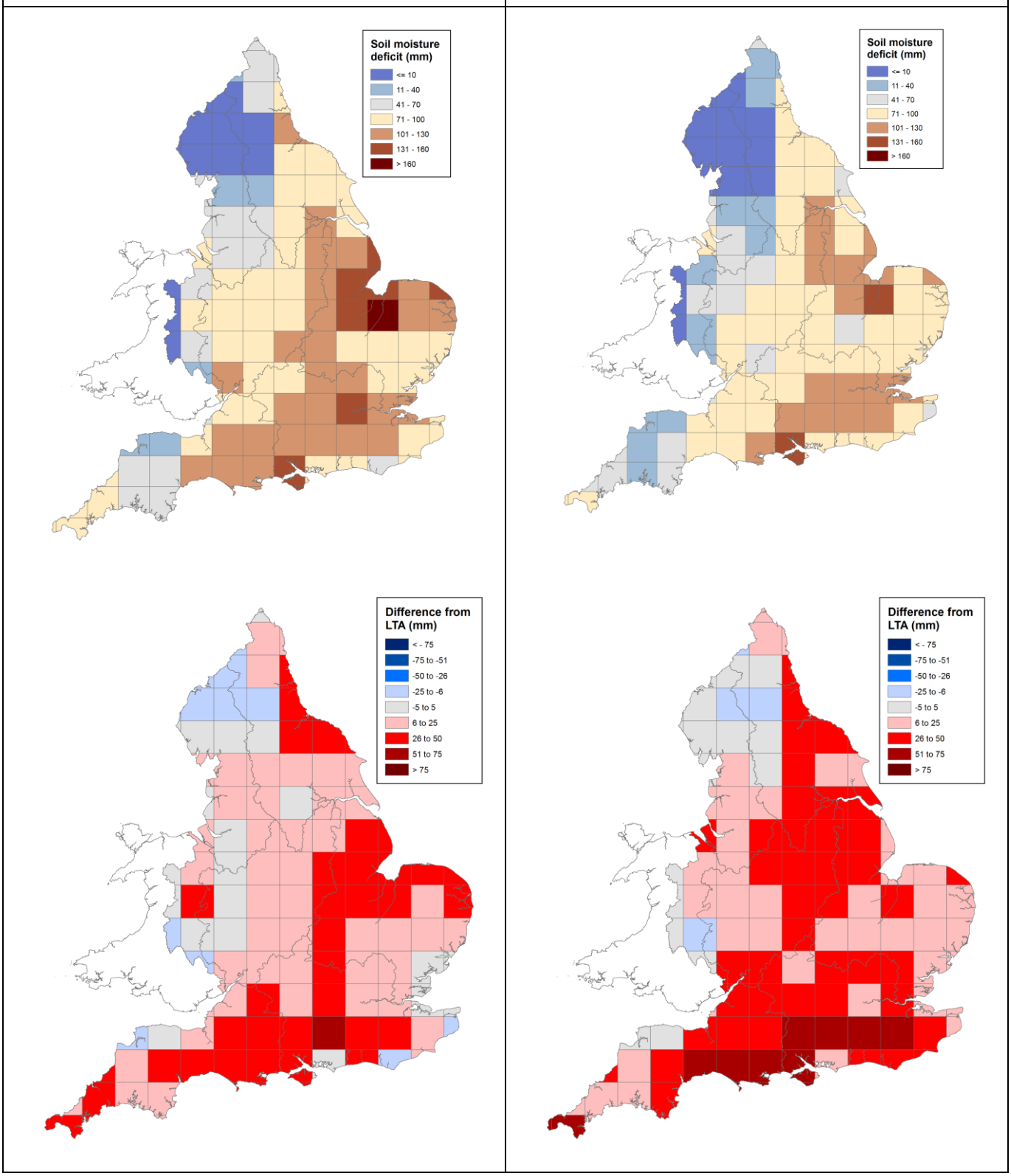
End of September 2018[1]	End of October 2018[2]
	

Figure 2.1: Soil moisture deficits for weeks ending 25 September 2018 [1] (left panel) and 30 October 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

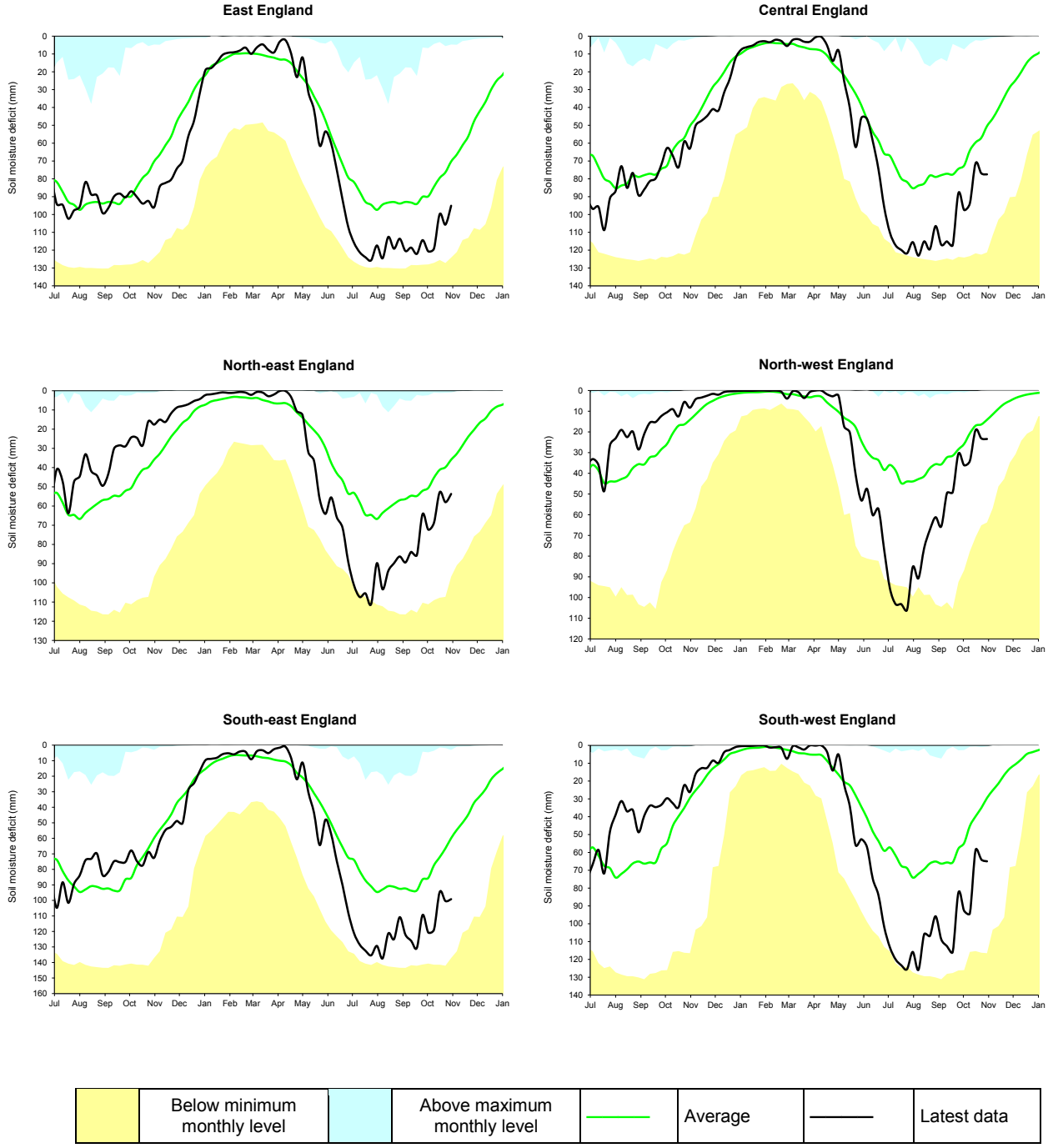
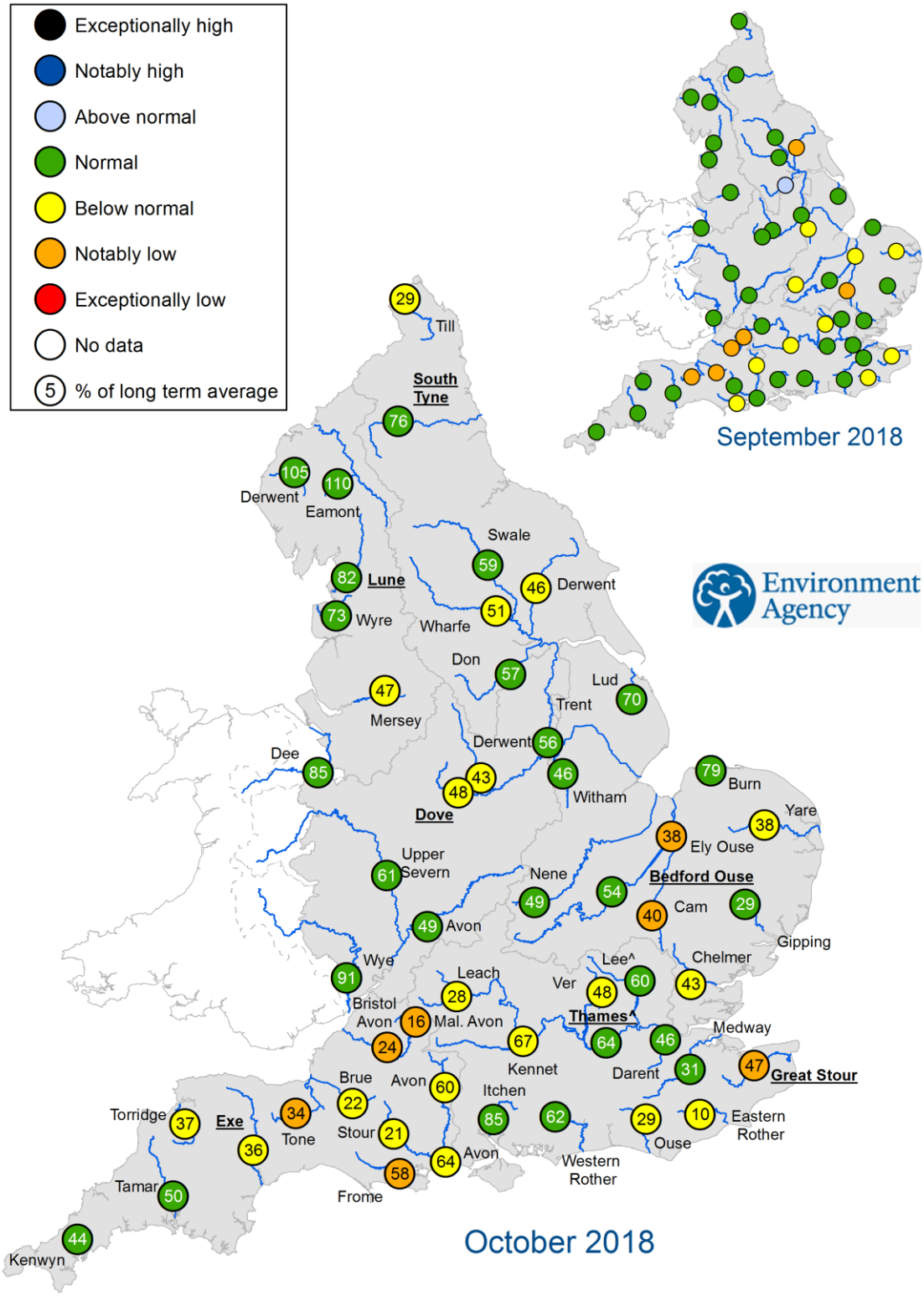


Figure 2.2: Latest soil moisture deficits for all geographic regions compared to maximum, minimum and 1961-90 long term average. Weekly MORECS data for real land use. (Source: Met Office © Crown Copyright, 2018).

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 September and October 2018, expressed as a percentage of the respective long term average and classed relative to an analysis of historic September and October monthly means (Source: Environment Agency). Crown copyright. All rights reserved. Environment Agency, 100026380, 2018.

River flow charts

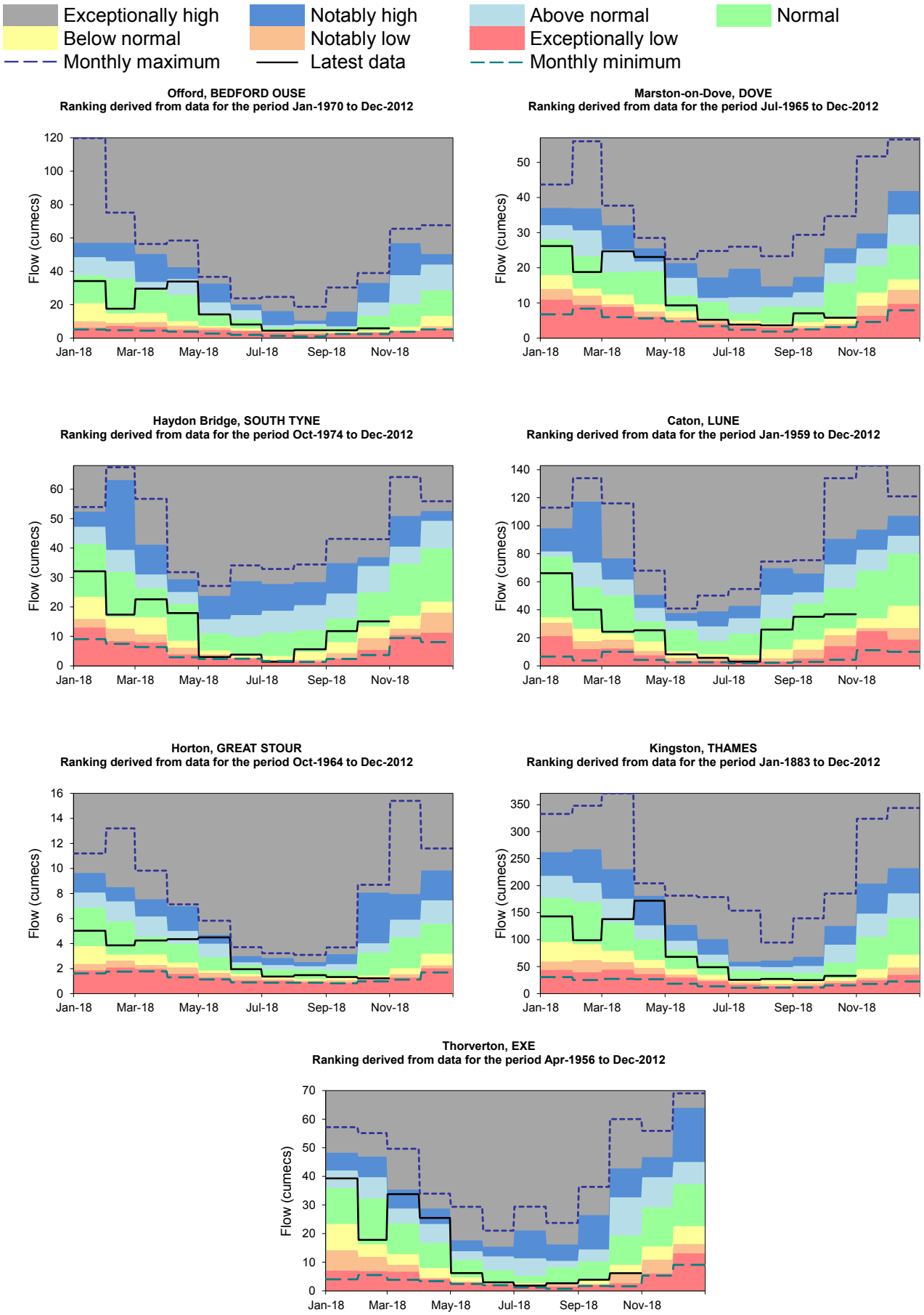
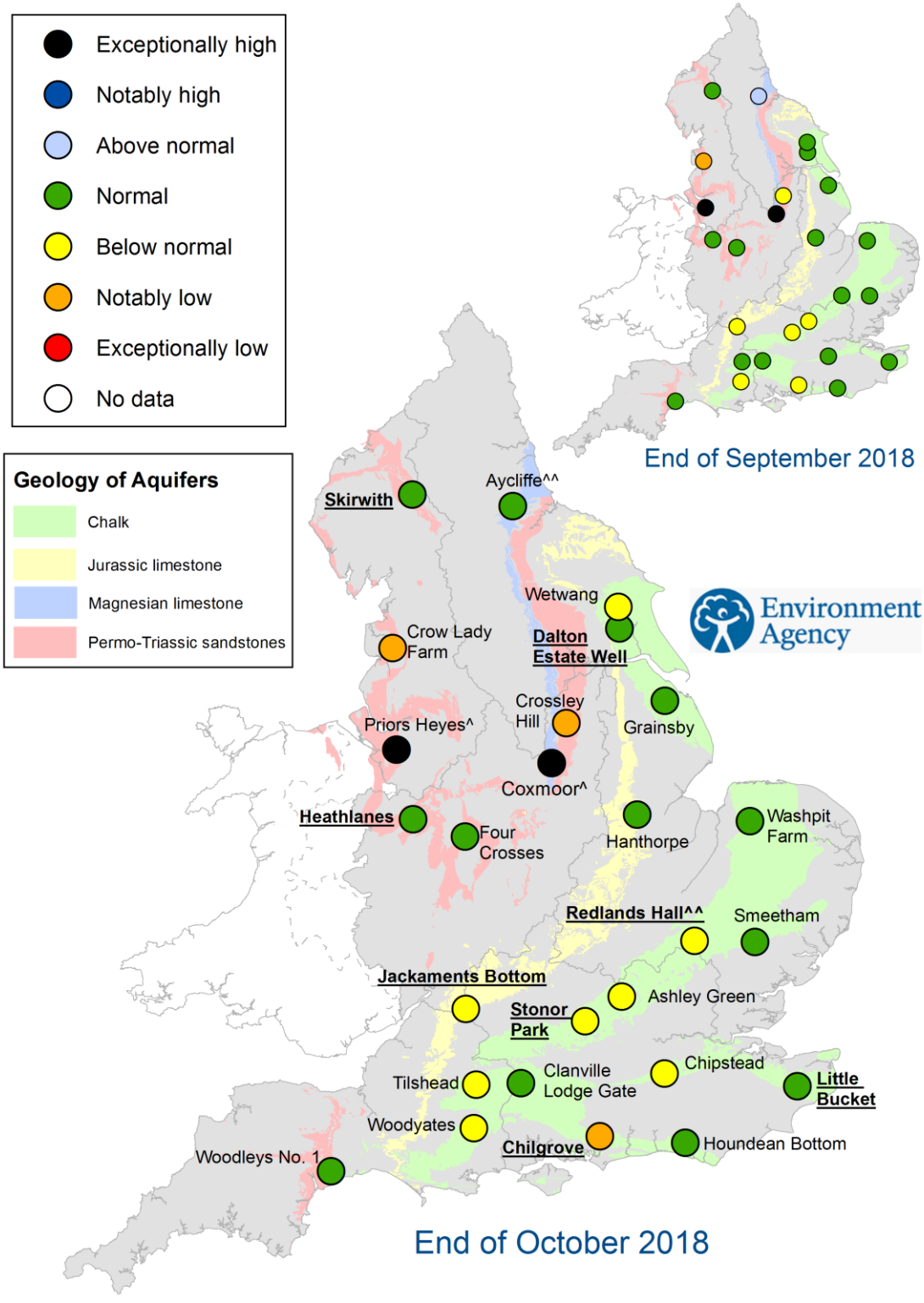


Figure 3.2: Index river flow sites for each geographic region. Monthly mean flow compared to an analysis of historic monthly mean flows, long term maximum and minimum flows. (Source: Environment Agency).

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

Figure 4.1: Groundwater levels for indicator sites at the end of September and October 2018, classed relative to an analysis of respective historic September and October 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

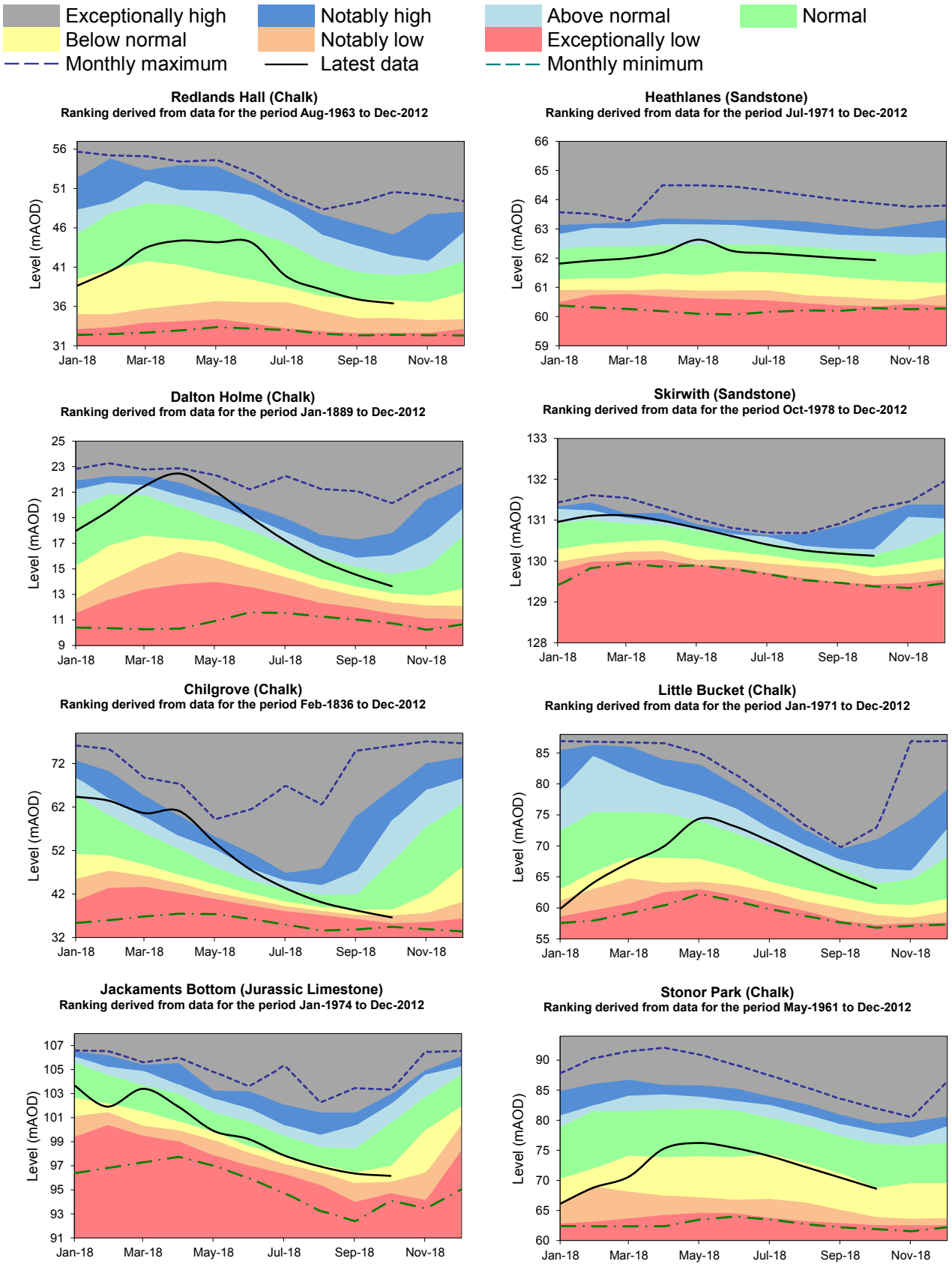
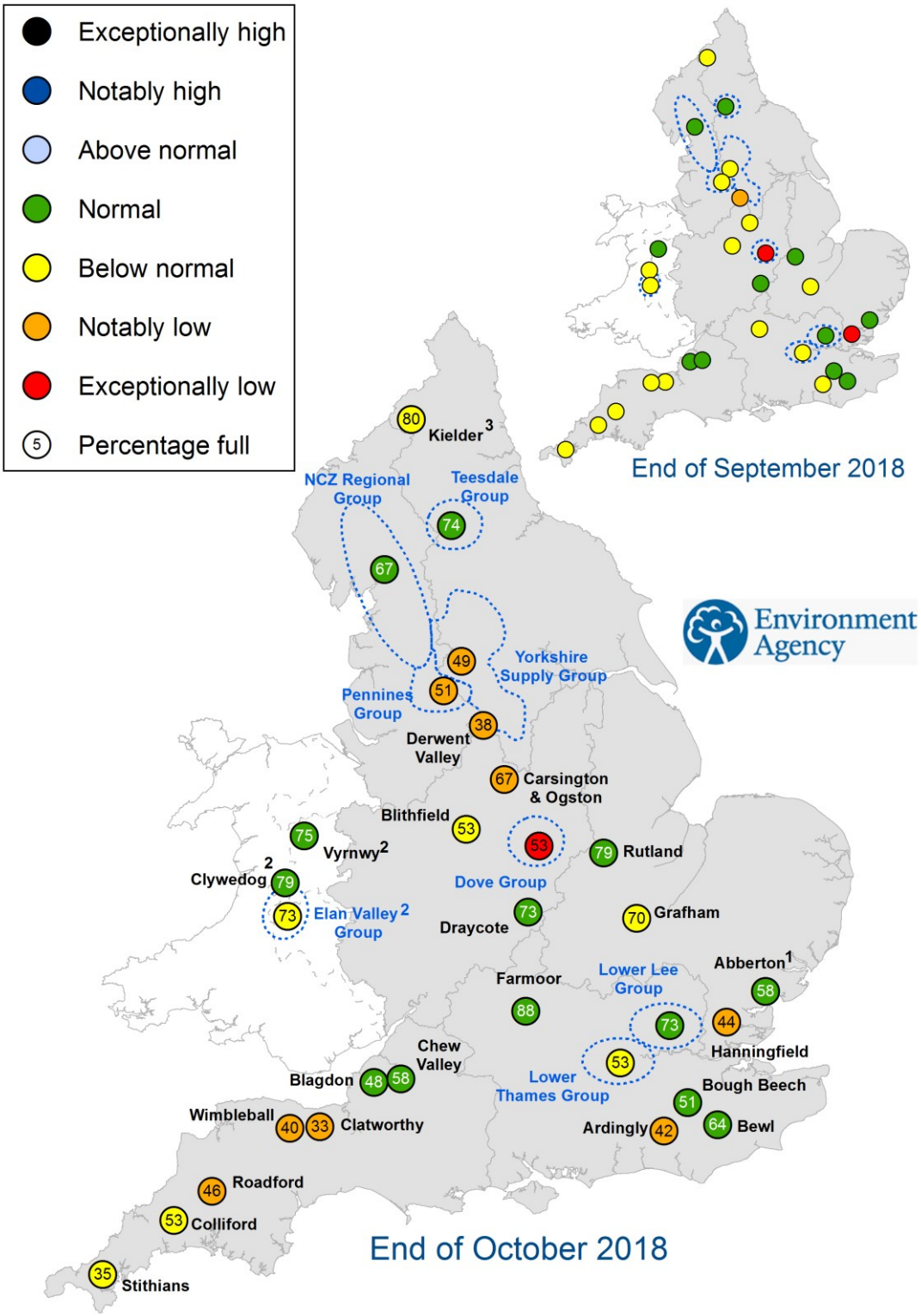


Figure 4.2: Index groundwater level sites for major aquifers. End of month groundwater levels months compared to an analysis of historic end of month levels and long term maximum and minimum levels. (Source: Environment Agency, 2018).

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 September and October 2018 as a percentage of total capacity and classed relative to an analysis of historic September and October 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

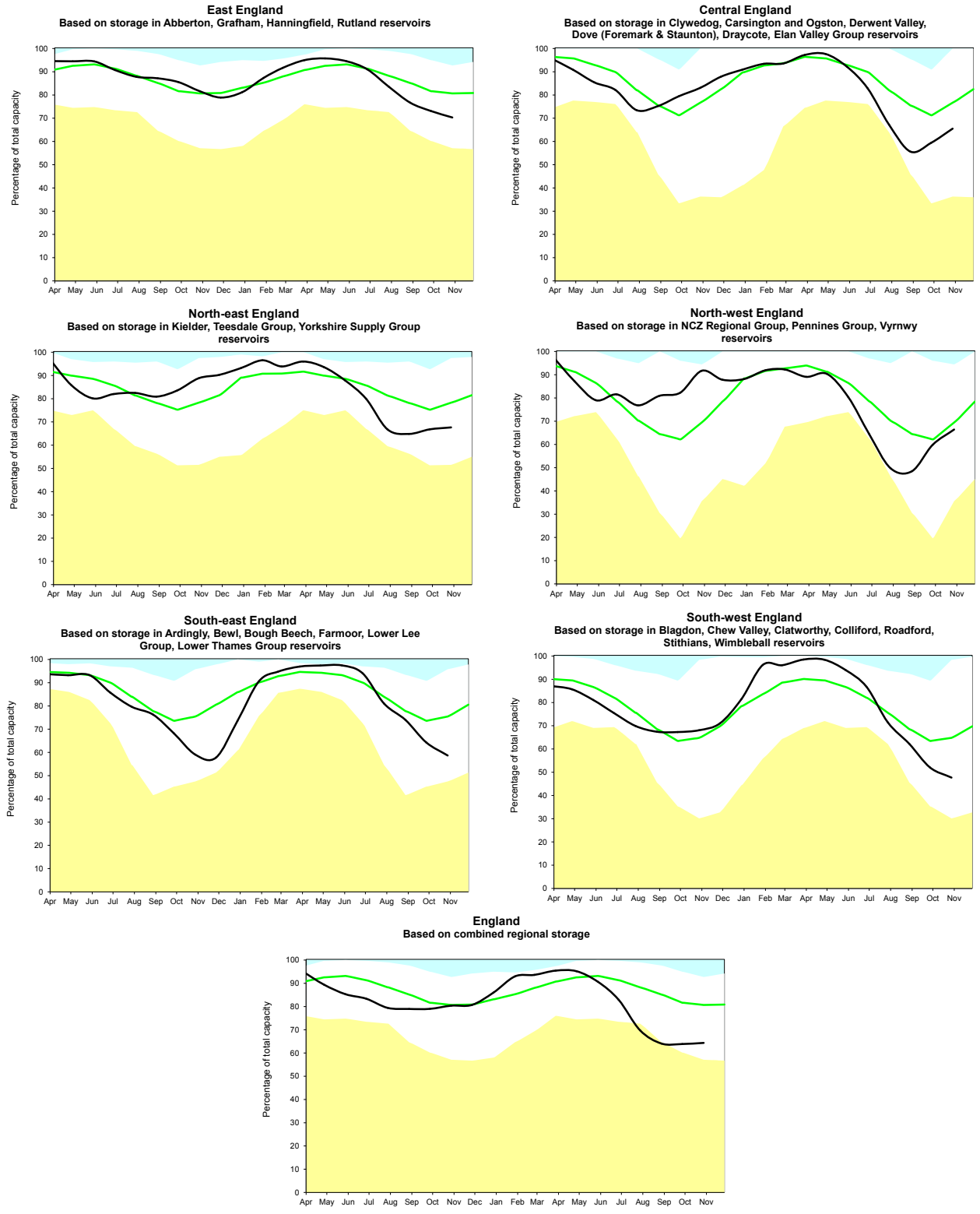


Figure 5.2: Regional reservoir stocks. End of month reservoir stocks compared to long term maximum, minimum and average stocks (Source: Water Companies). Note: Historic records of individual reservoirs/reservoir groups making up the regional values vary in length.

Forward look – river flow

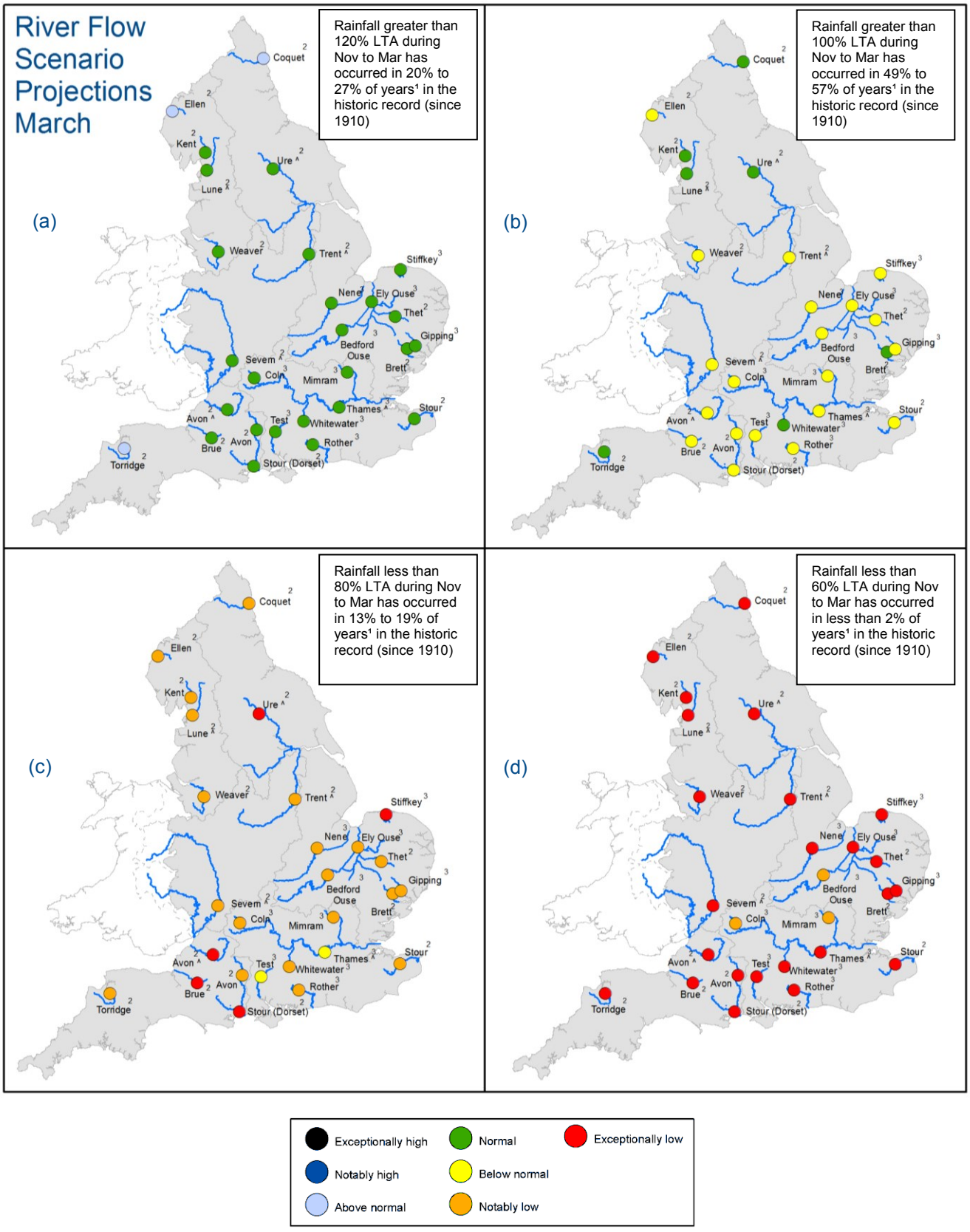
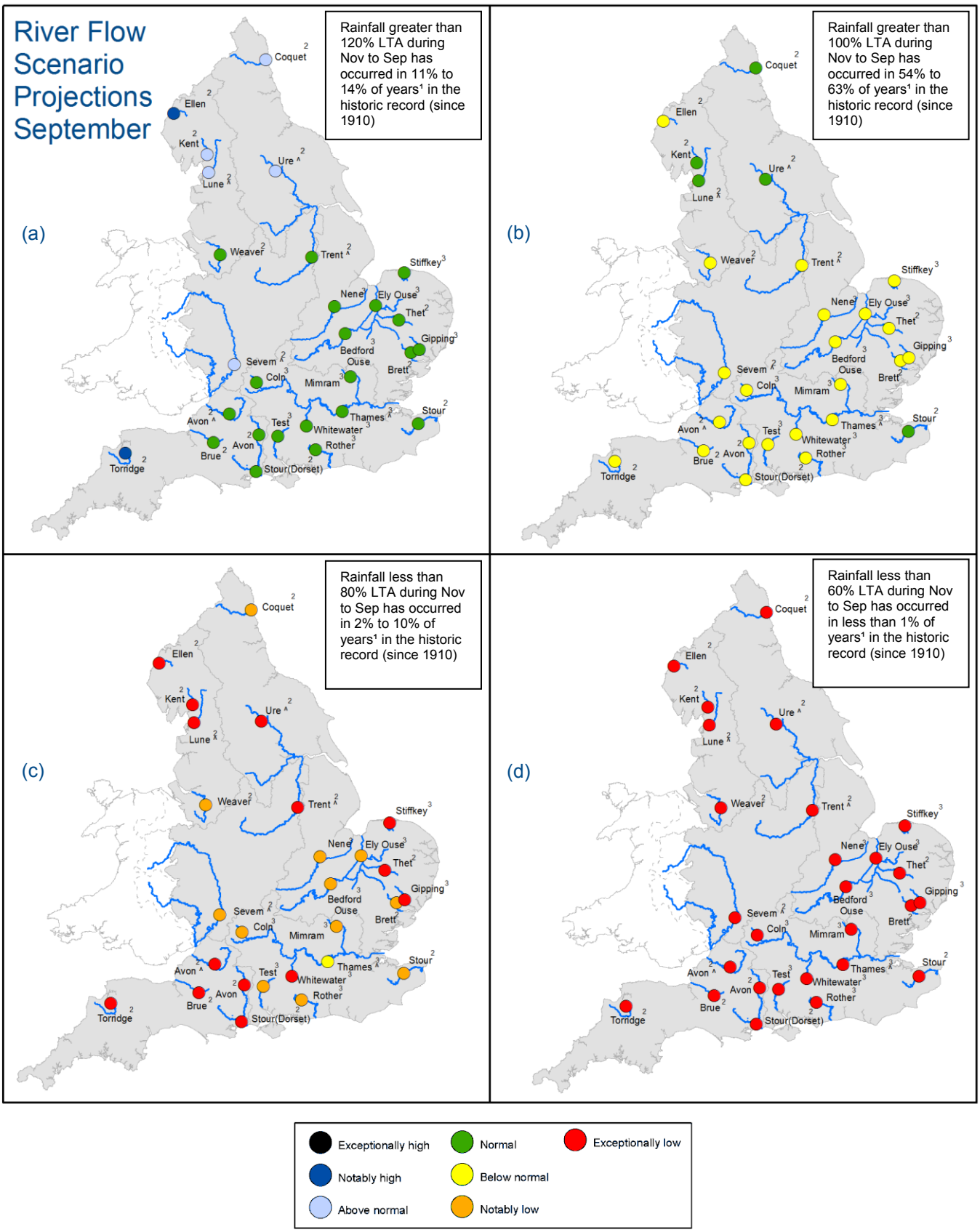


Figure 6.1: Projected river flows at key indicator sites up until the end of March 2019. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between November 2018 and March 2019 (Source: Centre for Ecology and Hydrology, Environment Agency).

[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*



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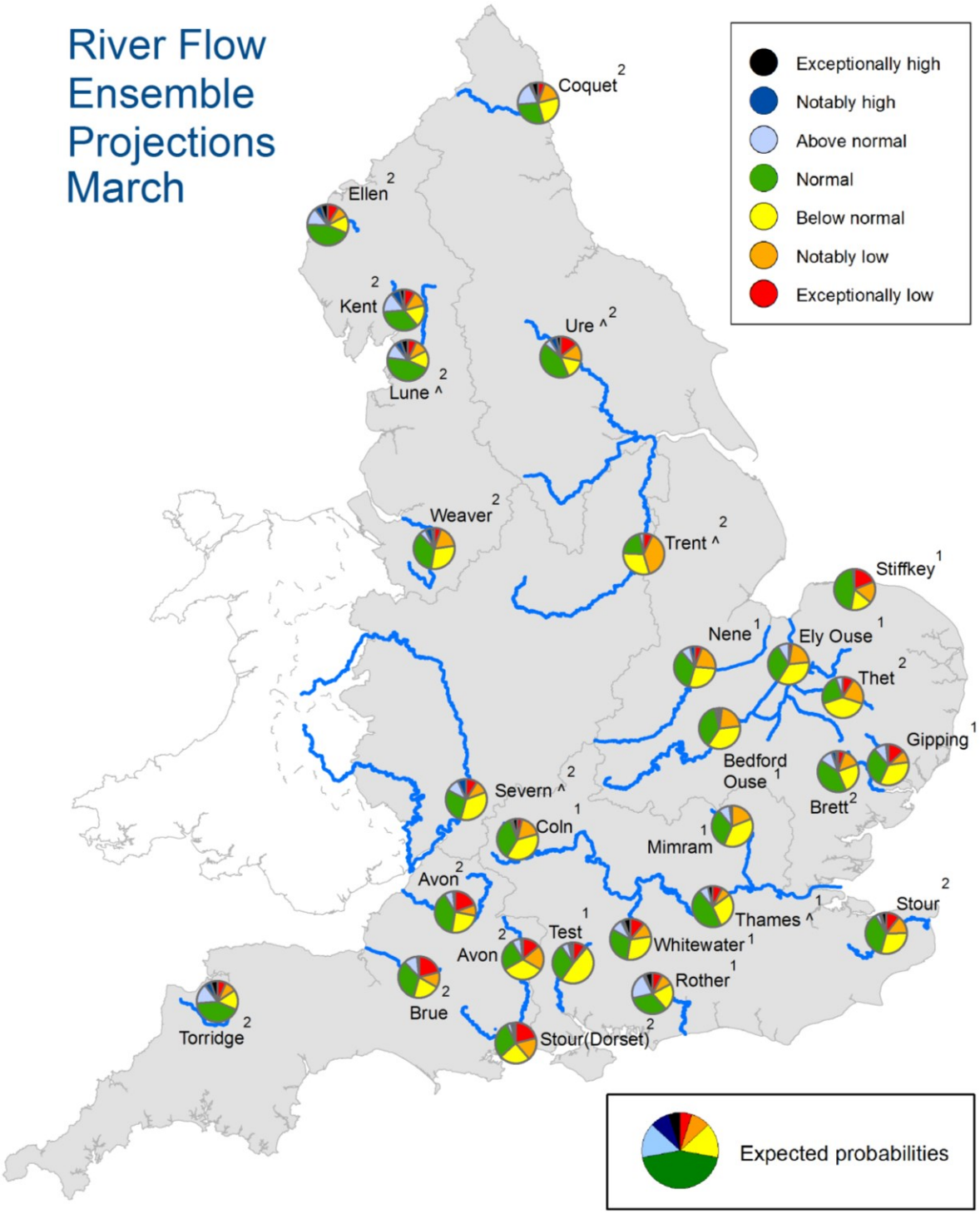

Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are 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 2019. 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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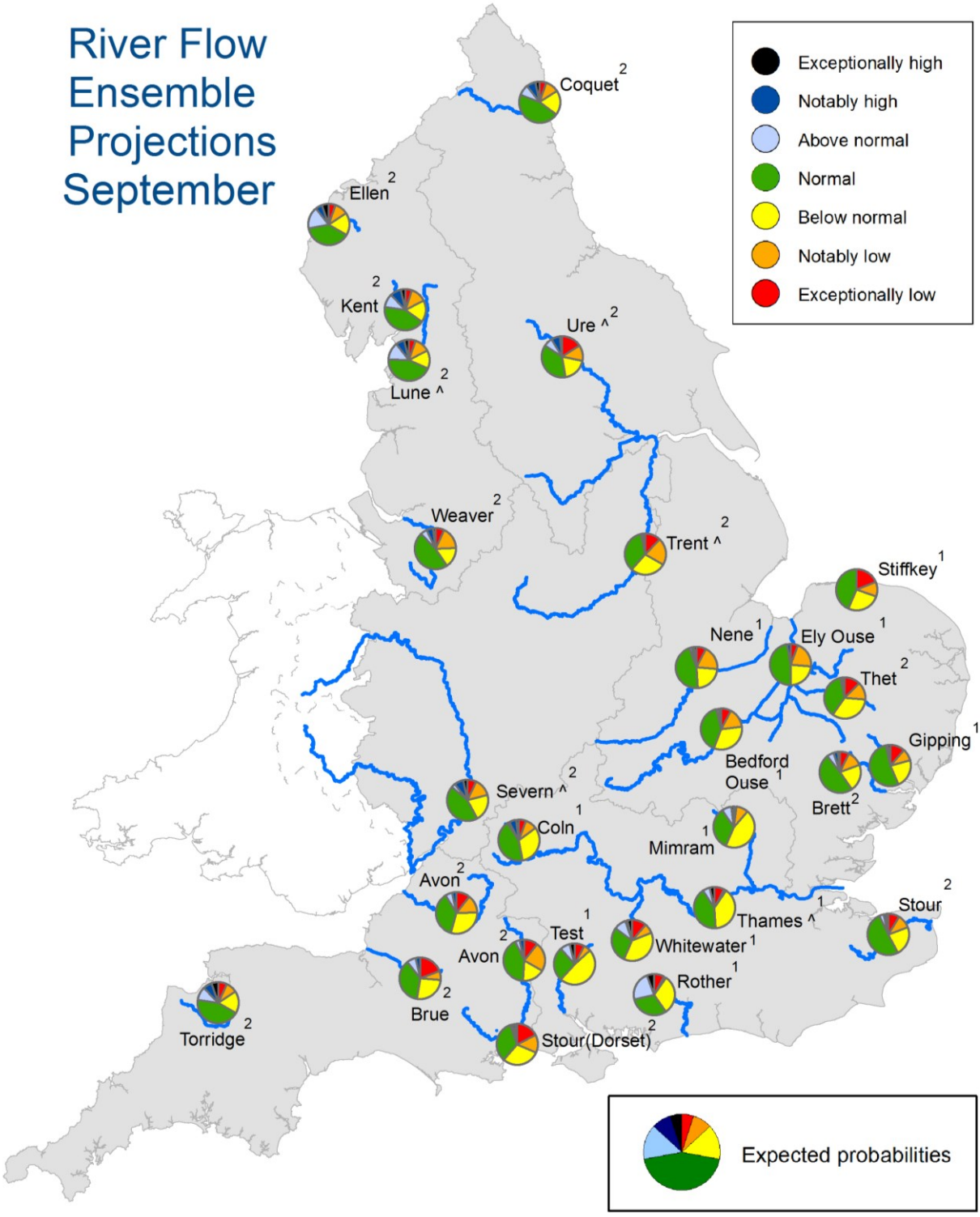

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Figure 6.4: Probabilistic ensemble projections of river flows at key indicator sites up until the end of September 2019. Pie charts indicate probability, based on climatology, of the surface water flow at each site being e.g. exceptionally low for 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
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Forward look - groundwater

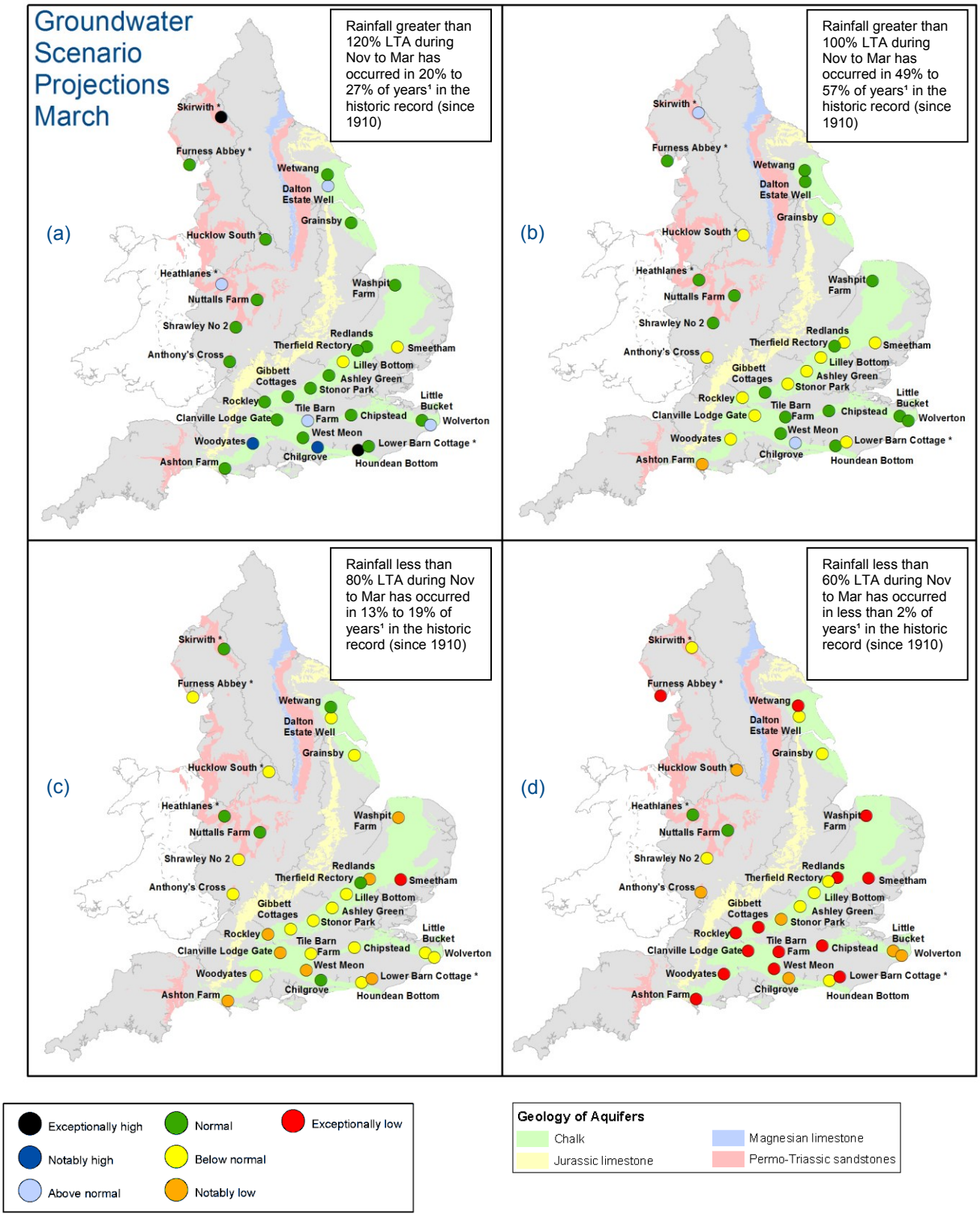

Figure 6.5: Projected groundwater levels at key indicator sites at the end of March 2019. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between November 2018 and March 2019 (Source: Environment Agency). Geological map reproduced with kind permission 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

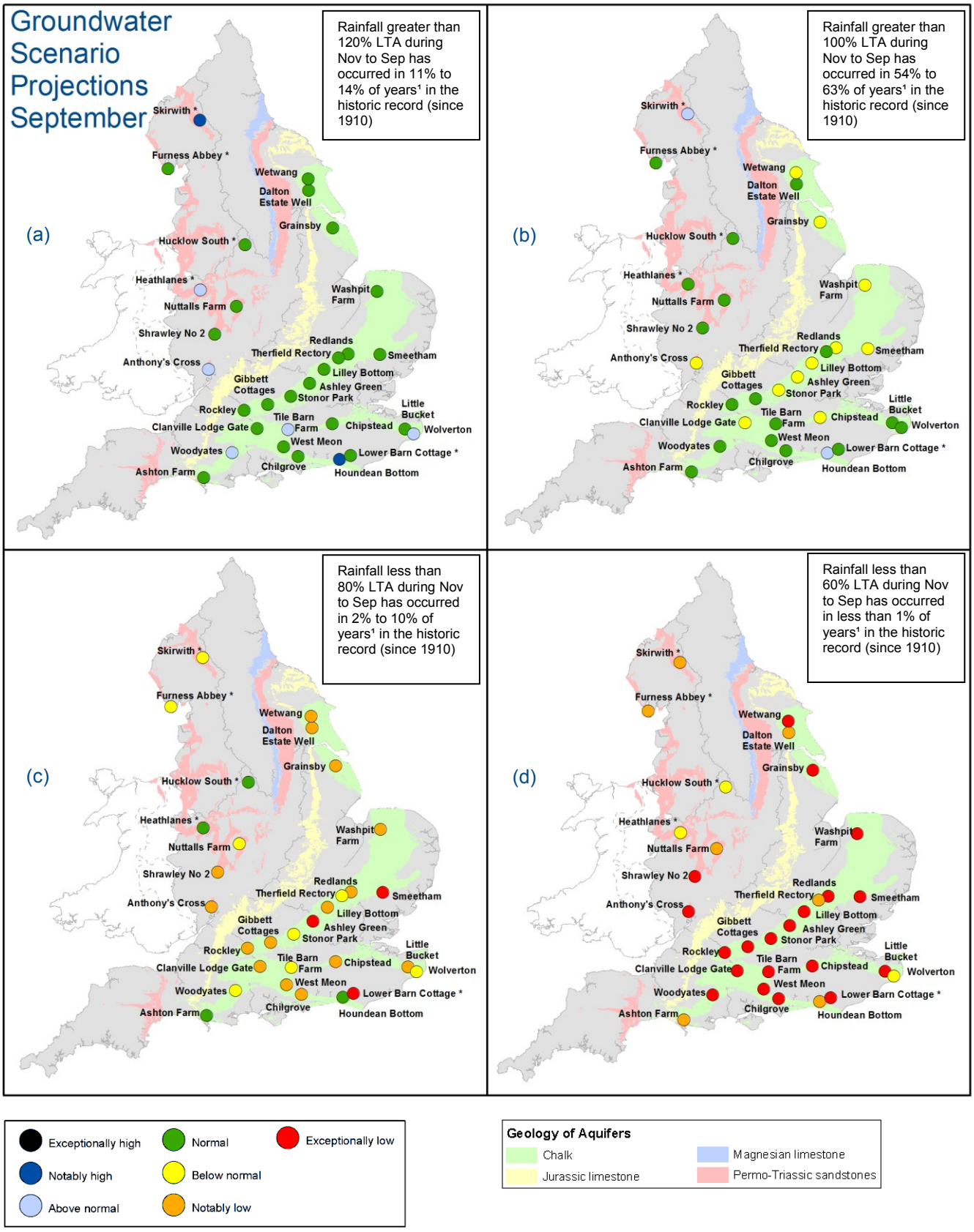

Figure 6.6: Projected groundwater levels at key indicator sites at the end of September 2019. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between November 2018 and September 2019 (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC Crown copyright. All rights reserved. Environment Agency 100026380 2018.

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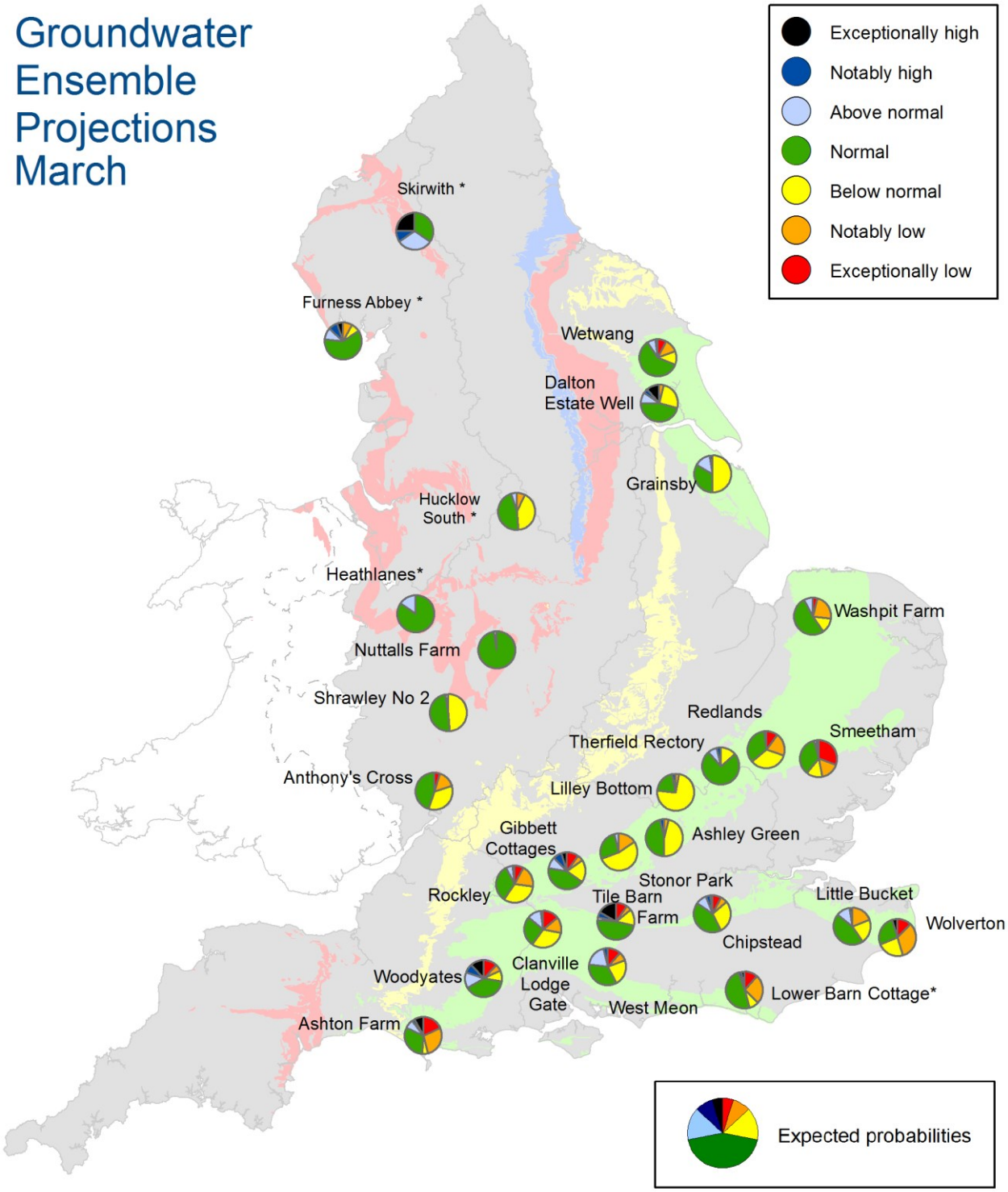
[1] This range of probabilities is a regional analysis



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 2019. 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*

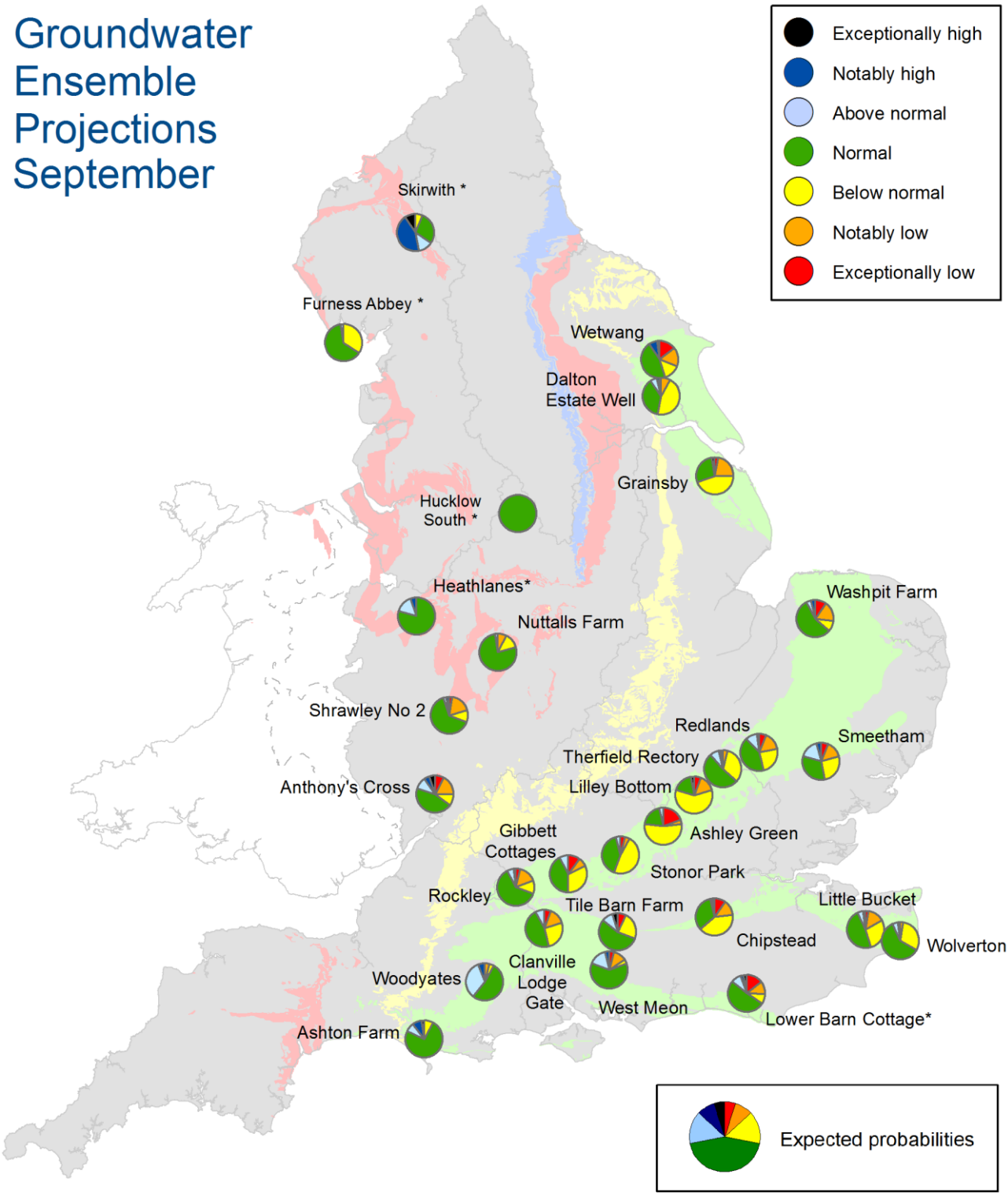


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Figure 6.8: Probabilistic ensemble projections of groundwater levels at key indicator sites at the end of September 2019. Pie charts indicate probability, based on climatology, of the groundwater level at each site being e.g. exceptionally low for 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