Monthly water situation report

England

Summary – May 2022

Rainfall for May was close to average across England with monthly rainfall totals for almost all catchments classed as normal for the time of year. Soil moisture deficits have continued to increase across the country as anticipated at this time of year, however the influence of very dry conditions in April continue to be felt with soils remaining drier than average. River flows decreased in May at all but two of the indicator sites we report on, with the majority classed as below normal and notably low for the time of year. Groundwater levels continued their seasonal decline at all indicator sites, with the majority of sites classed recording normal or lower groundwater levels at the end of May. Reservoir stocks declined at all except two of the reservoirs or reservoir groups we report on.

Rainfall

The May rainfall total for England was 50.7mm which represents 86% of the 1961-1990 long term average (LTA) (89% of the 1991-2020 LTA). The majority of catchments received around average rainfall during May. Kent was the wettest part of the country, as North Kent Chalk, Sheppy and Stour all received over 125% of the LTA for the time of year. In contrast the lowest totals for the month were recorded just north of London with the Lee Chalk receiving just 62% of LTA rainfall (Figure 1.1).

April rainfall totals were classed as normal in all but three catchments across England. The Lower Wye and Lee Chalk were both below normal for the time of year, while North Kent Chalk was above normal. The three month cumulative totals showed a mixed picture across the country. The majority of catchments were classed as below normal however across the country in the east, north-west, west and south a third of catchments were notably low. In the north, the six month cumulative rainfall totals are largely normal, with below normal and notably low totals dominating in the south. Twelve month cumulative totals show a similarly mixed picture, although below normal and notably low totals are concentrated in a band from the south-west to the north-east. (Figure 1.2)

At a regional scale, May rainfall totals were normal for all regions and for England as a whole. (Figure 1.3)

Soil moisture deficit

Although rainfall was normal across England, soil moisture deficits (SMD) continued to increase, as expected at this time of year with warmer temperatures and the growing season well under way. (Figure 2.1)

The majority of England continued to feel the impacts of a very dry April, with end of May soil moisture deficits greater than would be expected at this time of year. However, soils in parts of northern England remain close to the LTA. (Figure 2.2).

River flows

In May, monthly mean river flows decreased at all but two of the indicator sites we report on. Despite this, a fifth of sites across England were classed as normal for the time of year. The majority of sites are classed in a lower banding than in April, with 24 sites recording below normal monthly mean flows, and 16 notably low. The River Tone near Taunton in the south-west was exceptionally low for the time of year. (Figure 3.1)

At the majority of the regional index sites monthly mean flows were classed as below normal for the time of year, except for the Bedford Ouse in east England which was notably low, and the River Lune in the north-west which was normal. (Figure 3.2)

Groundwater levels

Groundwater levels decreased or plateaued at all of the reported indicator sites during May as they continued their seasonal decline. End of month groundwater levels were classed as normal for the time of year at half of the indicator sites. Eight sites, predominately across southern England, recorded below normal levels, the exception being Wetwang in the Hull and East Riding Chalk. Two sites recorded notably low groundwater levels,

Jackaments Bottom in the Burford Jurassic limestone in the Cotswolds, and Houndean Bottom in the Brighton Chalk. In contrast, Coxmoor (Idle Torne Sandstone) and Weir Farm (Bridgnorth Sandstone) in central England both recorded above normal groundwater levels at the end of May. Priors Heyes (West Cheshire Sandstone) in the north-west was exceptionally high as groundwater levels continue to recover from the effects of historic abstraction which makes recent levels appear high compared to the historic record (Figures 4.1).

Major aquifer index sites showed a mixed picture at the end of May. Index sites in chalk aquifers ranged from normal levels at Dalton Estate Well in the north, Redlands Hall in the east and Chilgrove in the south, to below normal at Stonor Park and Little Bucket in the south. Jackaments Bottom (Burford Jurassic limestone) was notably low. Index sites in sandstone aquifers were normal at Skirwith (Carlisle Basin and Eden Valley sandstone) and above normal at Weir Farm (Bridgnorth Sandstone) (Figure 4.2).

Reservoir storage

End of May reservoir stocks decreased at all except two of the reservoirs and reservoir groups we report on. Six reservoirs or groups recorded a decrease of over 10% of total capacity in comparison to the end of April, including Stithians and Wimbleball in the south-west, Bough Beech in the south-east, Blithfield and Derwent Valley in central England (Figure 5.1).

End of month reservoir stocks were classed as normal for the time of year at a third of reported reservoirs. The majority of reservoirs and reservoir groups were classed as below normal or notably low. The 8 notably low reservoirs for the time of year were located across south-west and central England and in Wales. (Figure 5.1).

At a regional scale, total reservoir stocks ranged from 78% in north-west England to 94% in east England. Total reservoir stocks for England were at 85% of total capacity at the end of May (Figure 5.2).

Forward look

June began with changeable conditions bringing spells of rain and showers across the country. This is expected to continue through the middle of the month, although the south and south-east may see longer sunny periods and drier conditions. The end of the month is expected to be more unsettled, with wetter than average conditions for many places, although conditions are likely to be close to average moving in to July.

From June to August, the 3-month period has a higher chance than normal of being hot, although average temperatures remain the most likely outcome. The period is most likely to have average rainfall, with a lower than normal chance of wet conditions. [1]

Projections for river flows at key sites[2]
By the end of September 2022 and March 2023 most modelled sites have a greater than expected chance of cumulative river flows being normal or below normal for the time of year.

For scenario based projections of cumulative river flows at key sites by September 2022 see Figure 6.1
For scenario based projections of cumulative river flows at key sites by March 2023 see Figure 6.2
For probabilistic ensemble projections of cumulative river flows at key sites by September 2022 see Figure 6.3
For probabilistic ensemble projections of cumulative river flows at key sites by March 2023 see Figure 6.4

Projections for groundwater levels in key aquifers[2]
By the end of September 2022 most modelled sites in the Chalk aquifer have a greater than expected chance of normal or lower groundwater levels for the time of year. By the end of March 2023 the majority of modelled sites have a greater than expected chance of normal or lower groundwater levels for the time of year.

For scenario based projections of groundwater levels in key aquifers in September 2022 see Figure 6.5
For scenario based projections of groundwater levels in key aquifers in March 2023 see Figure 6.6
For probabilistic ensemble projections of groundwater levels in key aquifers in September 2022 see Figure 6.7
For probabilistic ensemble projections of groundwater levels in key aquifers in March 2023 see Figure 6.8

Authors: National Water Resources Hydrology Team

1 Source: Met Office
2 Information produced by the Hydrological Outlook, a partnership between UK Centre for Ecology and Hydrology, British Geological Survey, Met Office, Environment Agency and other devolved agencies.

Rainfall

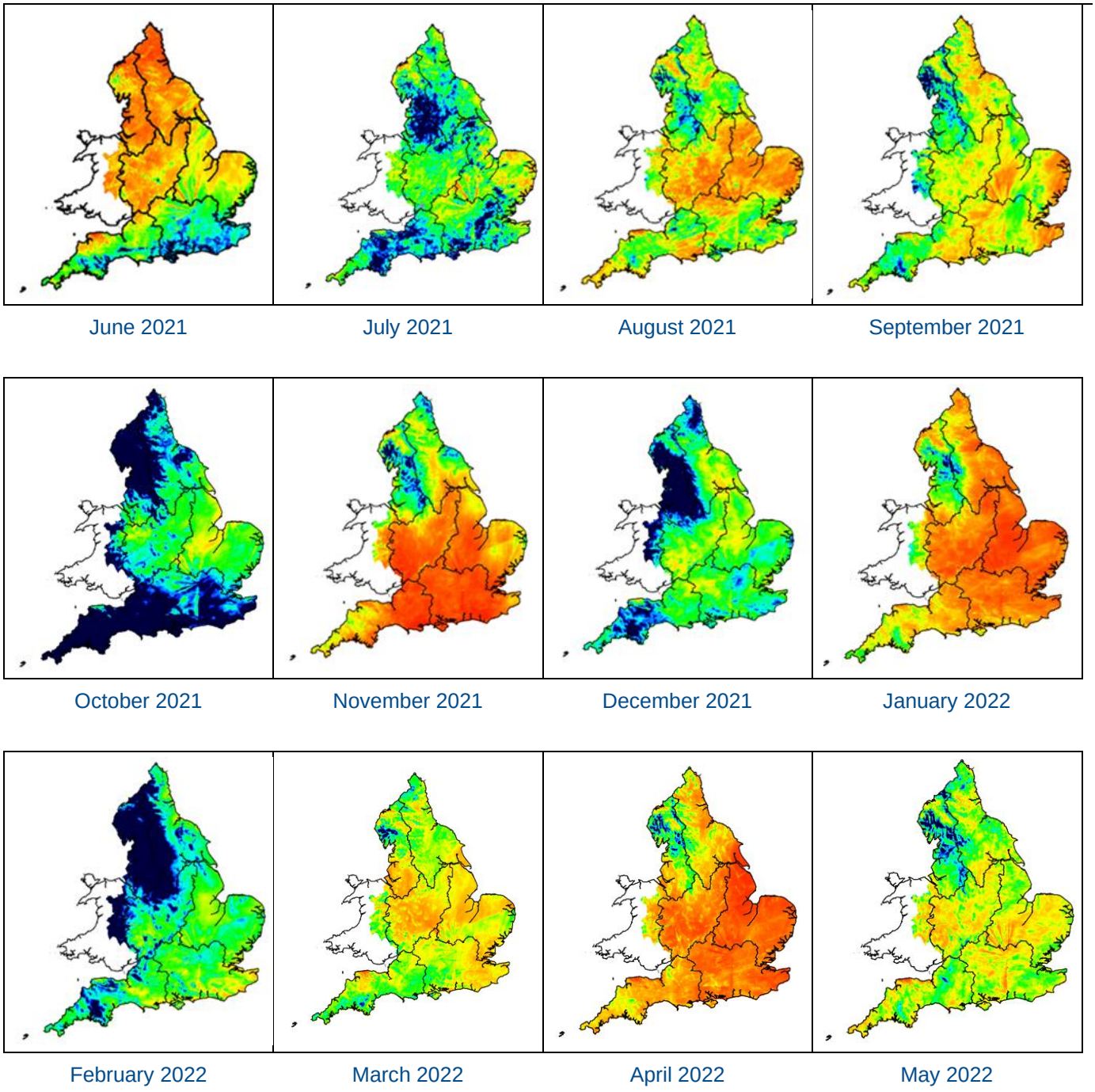


Figure 1.1: Monthly rainfall across England and Wales for the past 12 months. UKPP radar data (Source: Met Office © Crown Copyright, 2021). Note: Radar beam blockages in some regions may give anomalous totals in some areas. Crown copyright. All rights reserved. Environment Agency, 100024198, 2022.

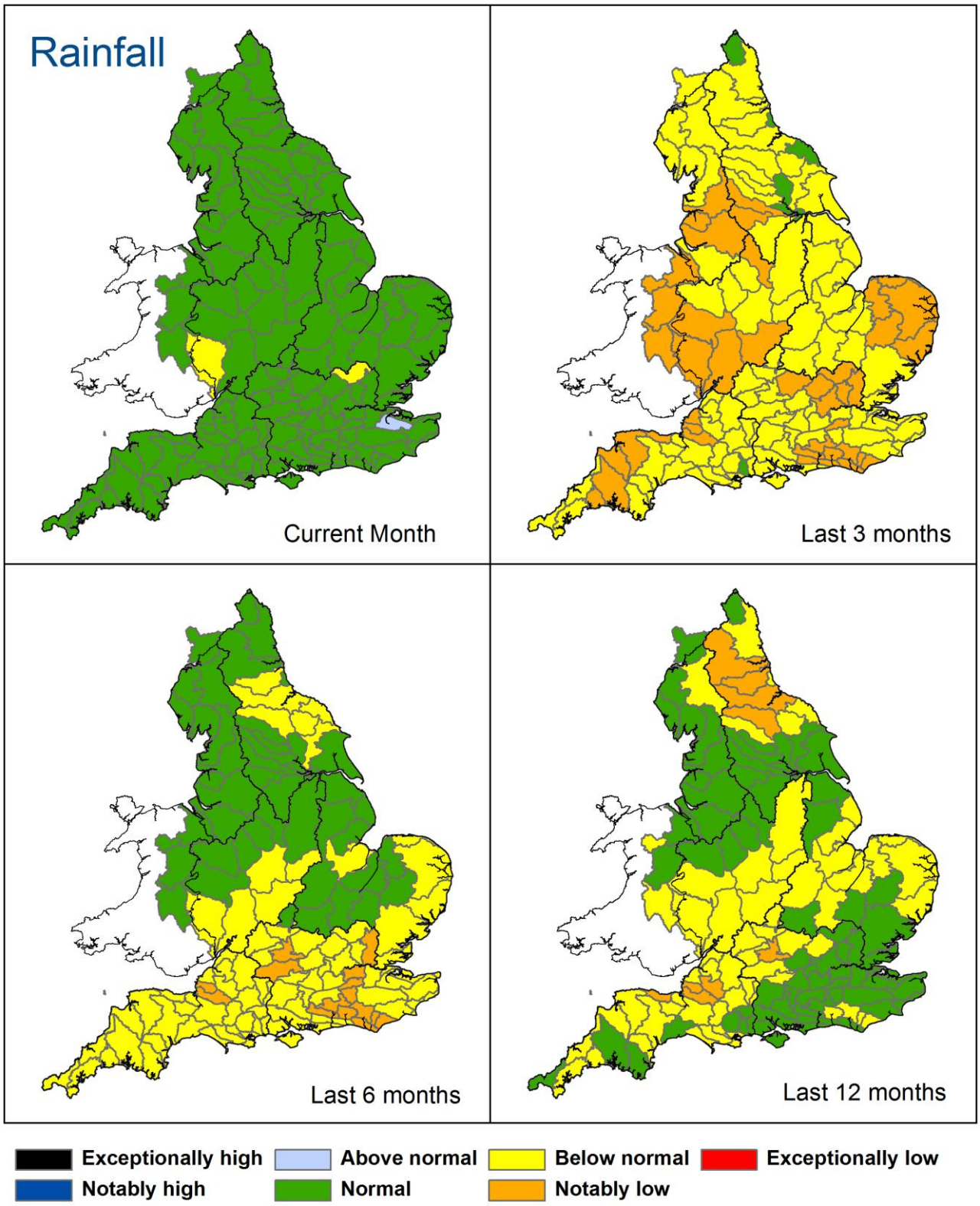


Figure 1.2: Total rainfall for hydrological areas across England for the current month (up to 31 May), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges *(Source: Met Office © Crown Copyright, 2022).* 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, 2022.

Rainfall charts

Above average rainfall

Below average rainfall

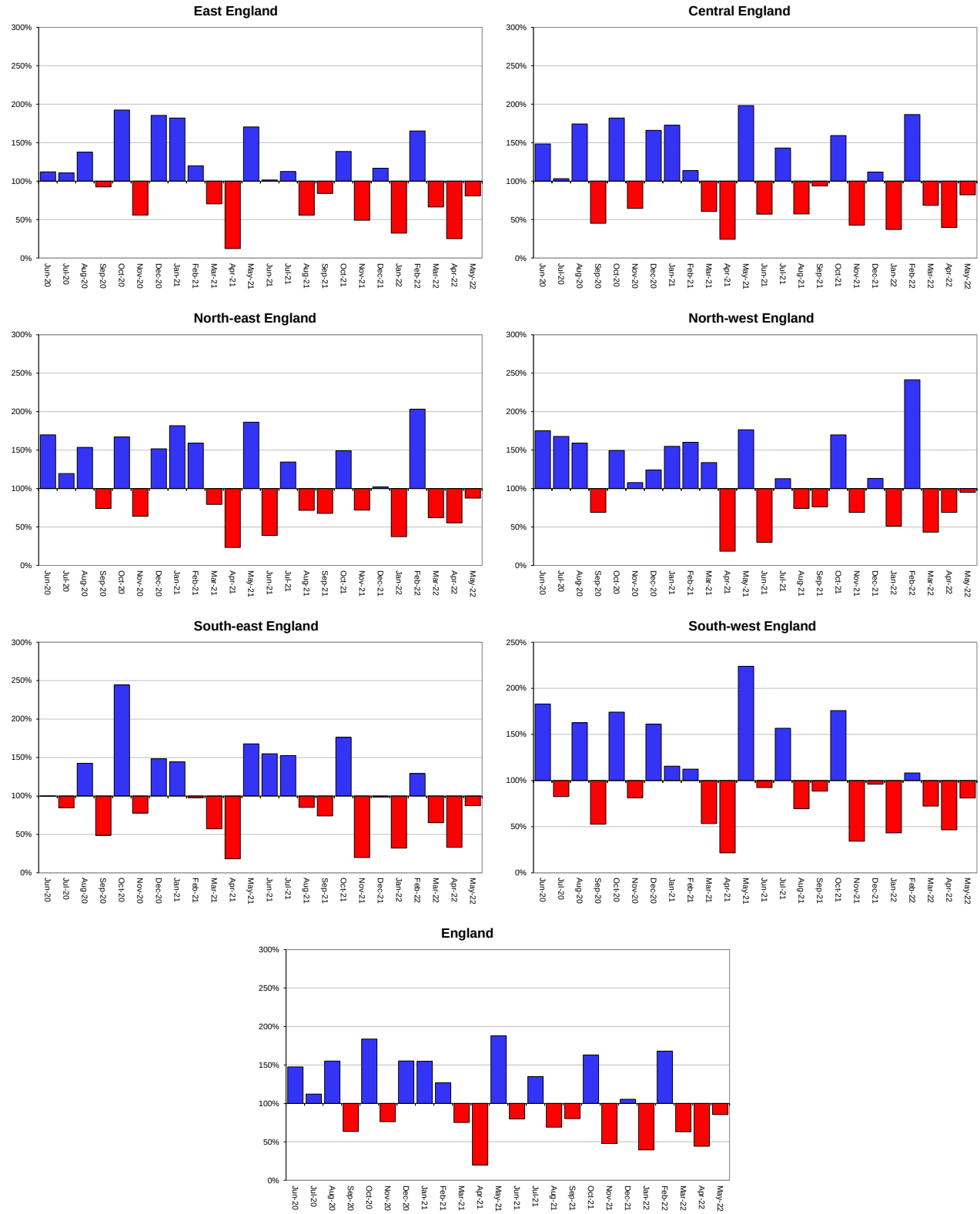


Figure 1.3: Monthly rainfall totals for the past 24 months as a percentage of the 1961 to 1990 long term average for each region and for England. HadUK rainfall data. (Source: Met Office © Crown Copyright, 2022).

Soil moisture deficit

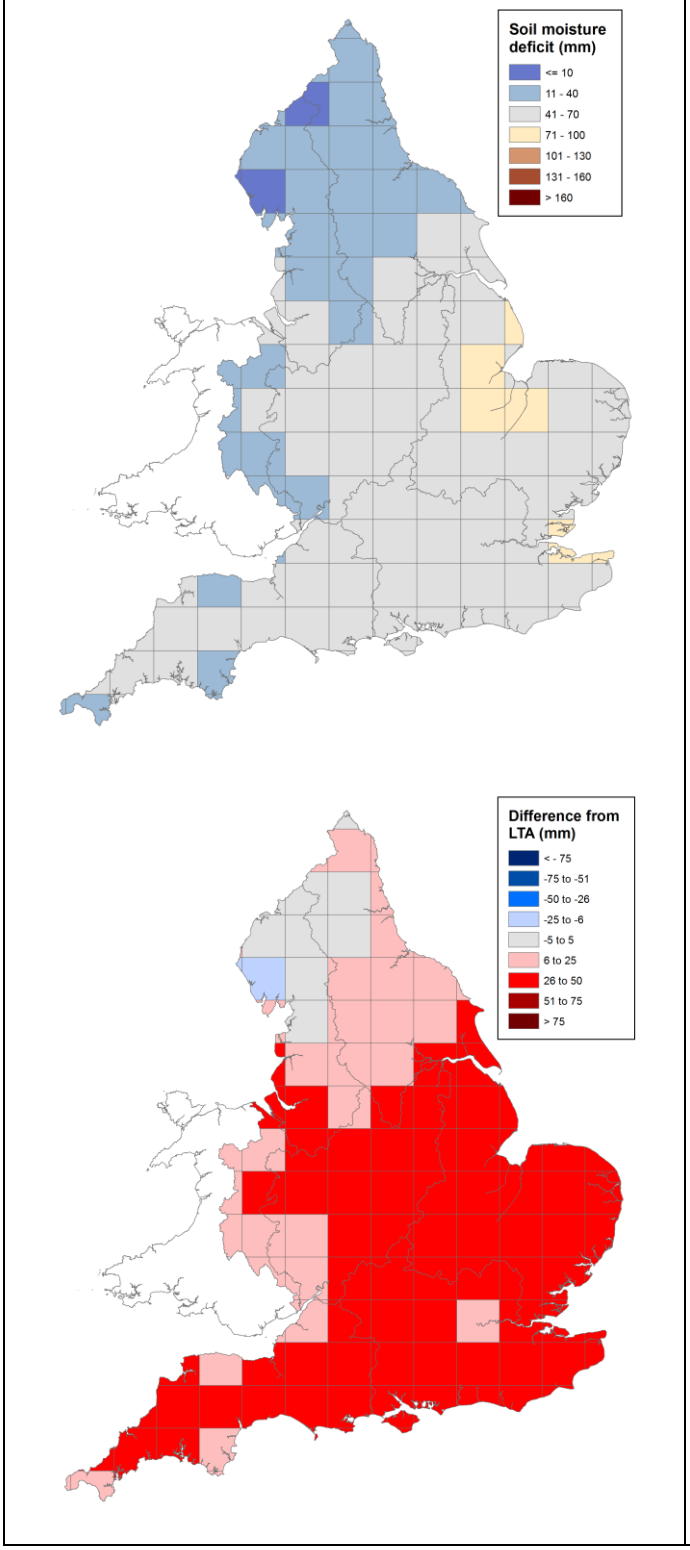
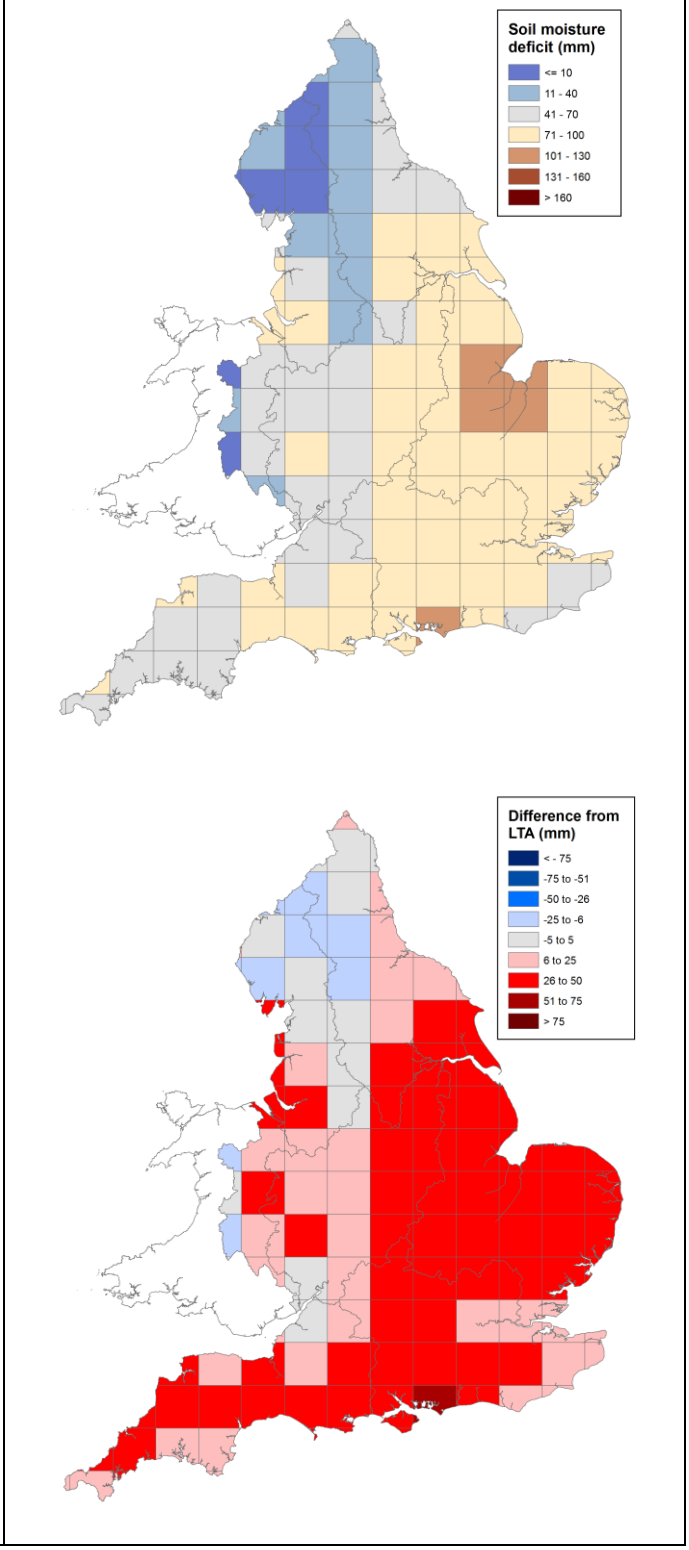
End of April 2022[1]	End of May 2022[2]
	

Figure 2.1: Soil moisture deficits for weeks ending 3 May 2022 [1] (left panel) and 31 May 2022 [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, 2021). Crown copyright. All rights reserved. Environment Agency, 100024198, 2022

Soil moisture deficit charts

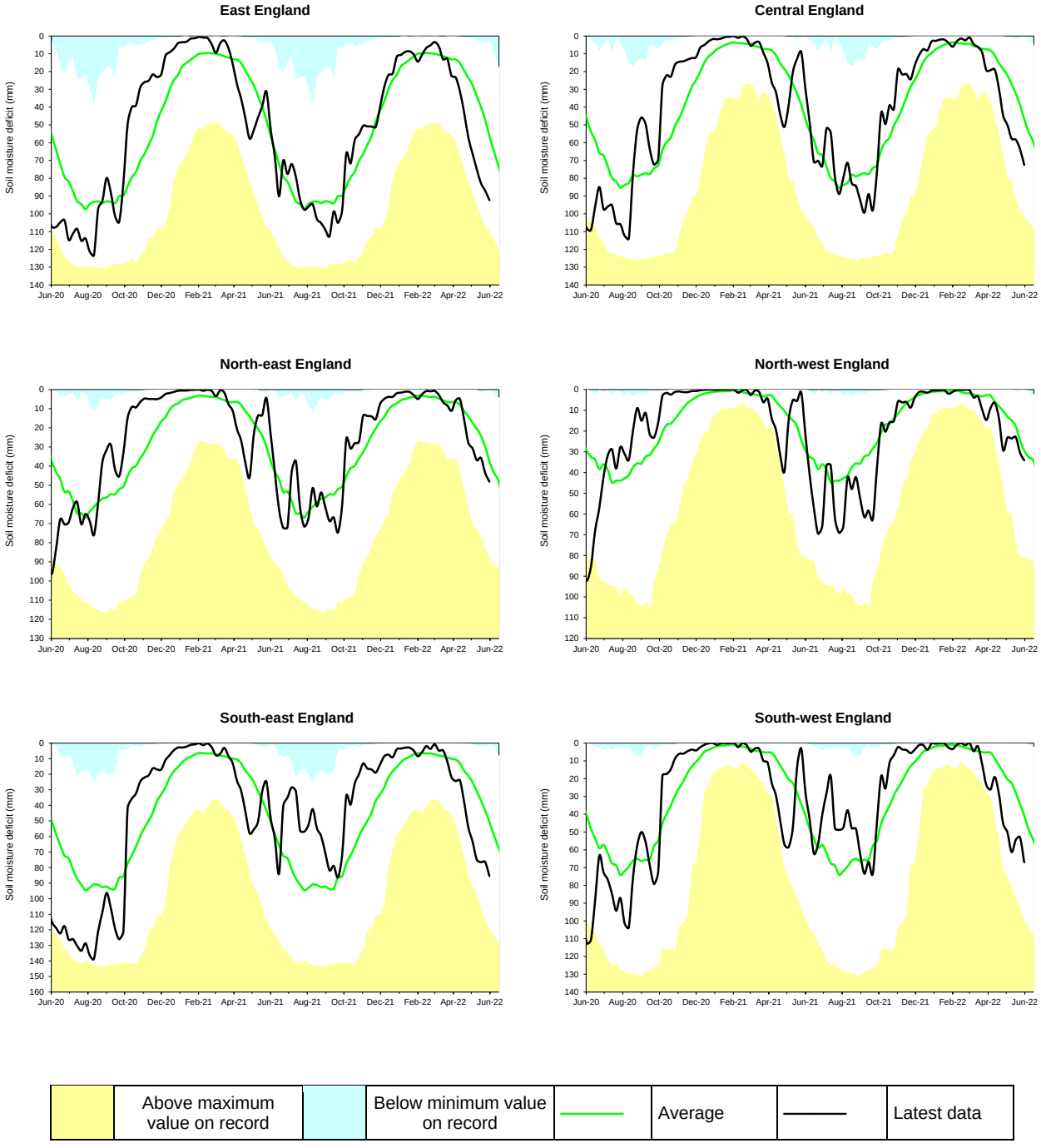
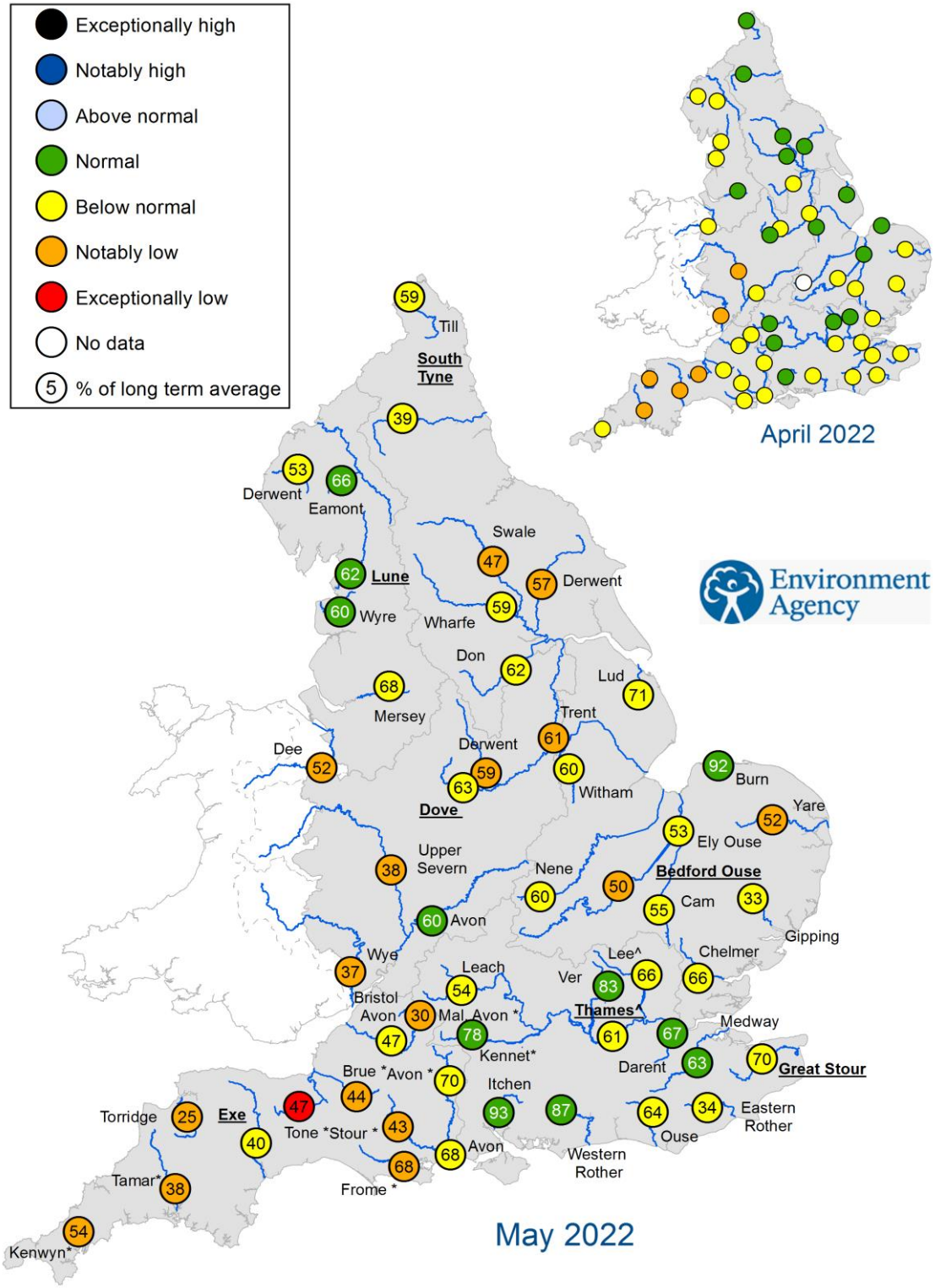


Figure 2.2: Latest soil moisture deficits for all geographic regions compared to maximum, minimum and 1961 to 90 long term average. Weekly MORECS data for real land use. (Source: Met Office © Crown Copyright, 2022).

River flows



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

* Flows may be overestimated at these sites – data should be treated with caution

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 April 2022 and May 2022, expressed as a percentage of the respective long term average and classed relative to an analysis of historic April and May monthly means (Source: Environment Agency). Crown copyright. All rights reserved. Environment Agency, 100024198, 2022.

River flow charts

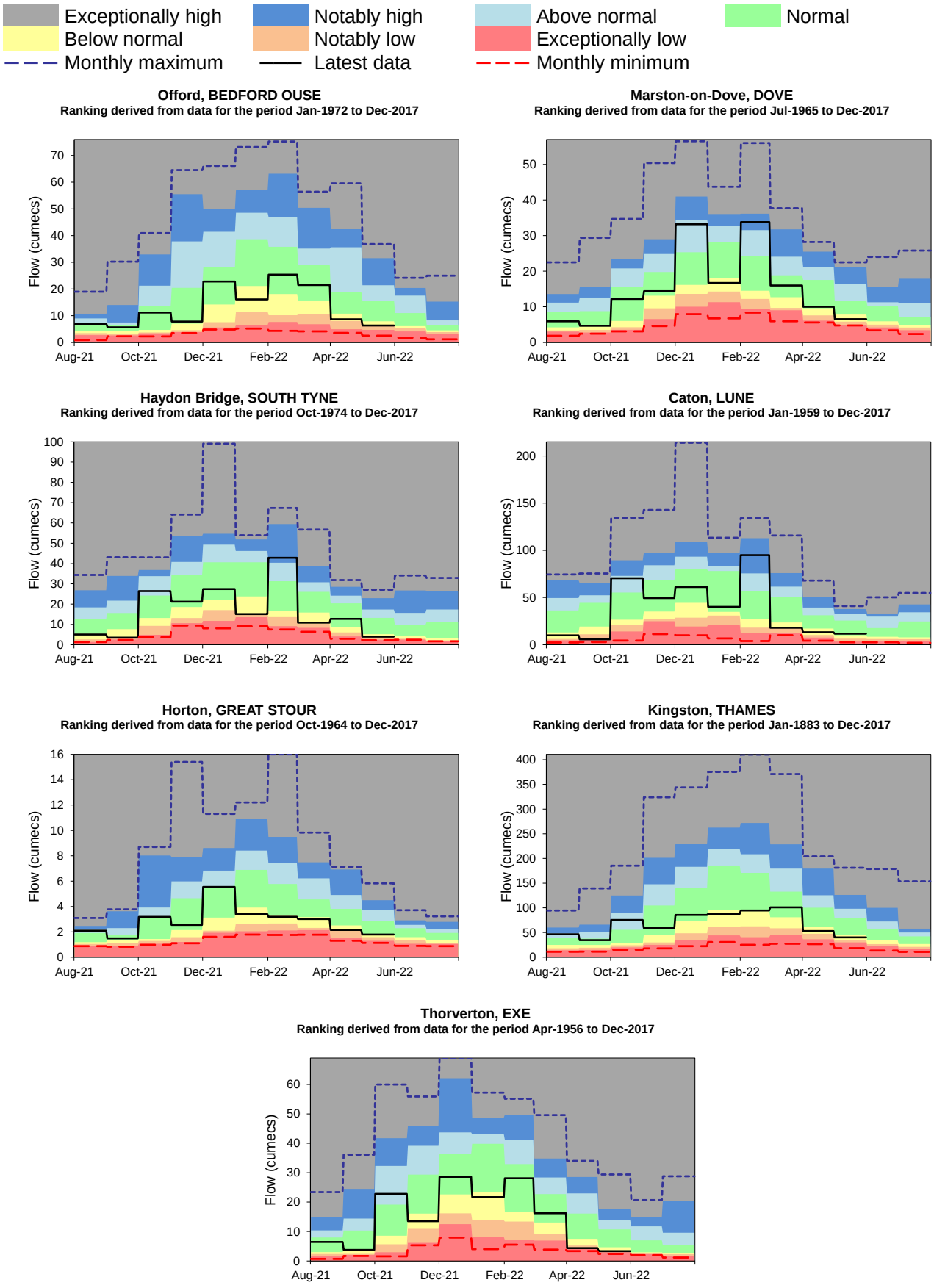
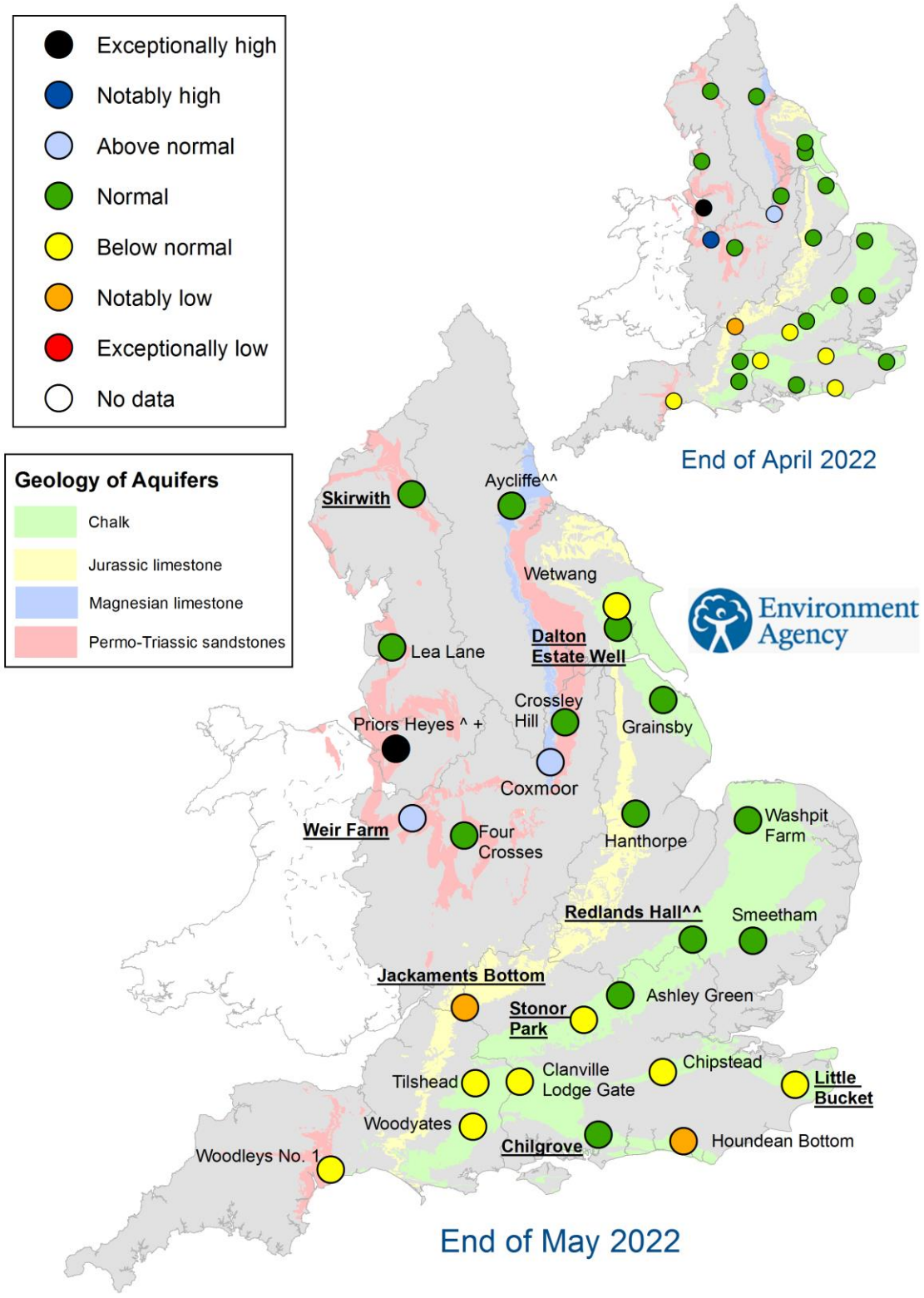


Figure 3.2: Index river flow sites for each geographic region. Monthly mean flow compared to an analysis of historic monthly mean flows, long term maximum and minimum flows. (Source: Environment Agency).

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/lowest 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 April 2022 and May 2022, classed relative to an analysis of respective historic April and May levels (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2022.

Groundwater level charts

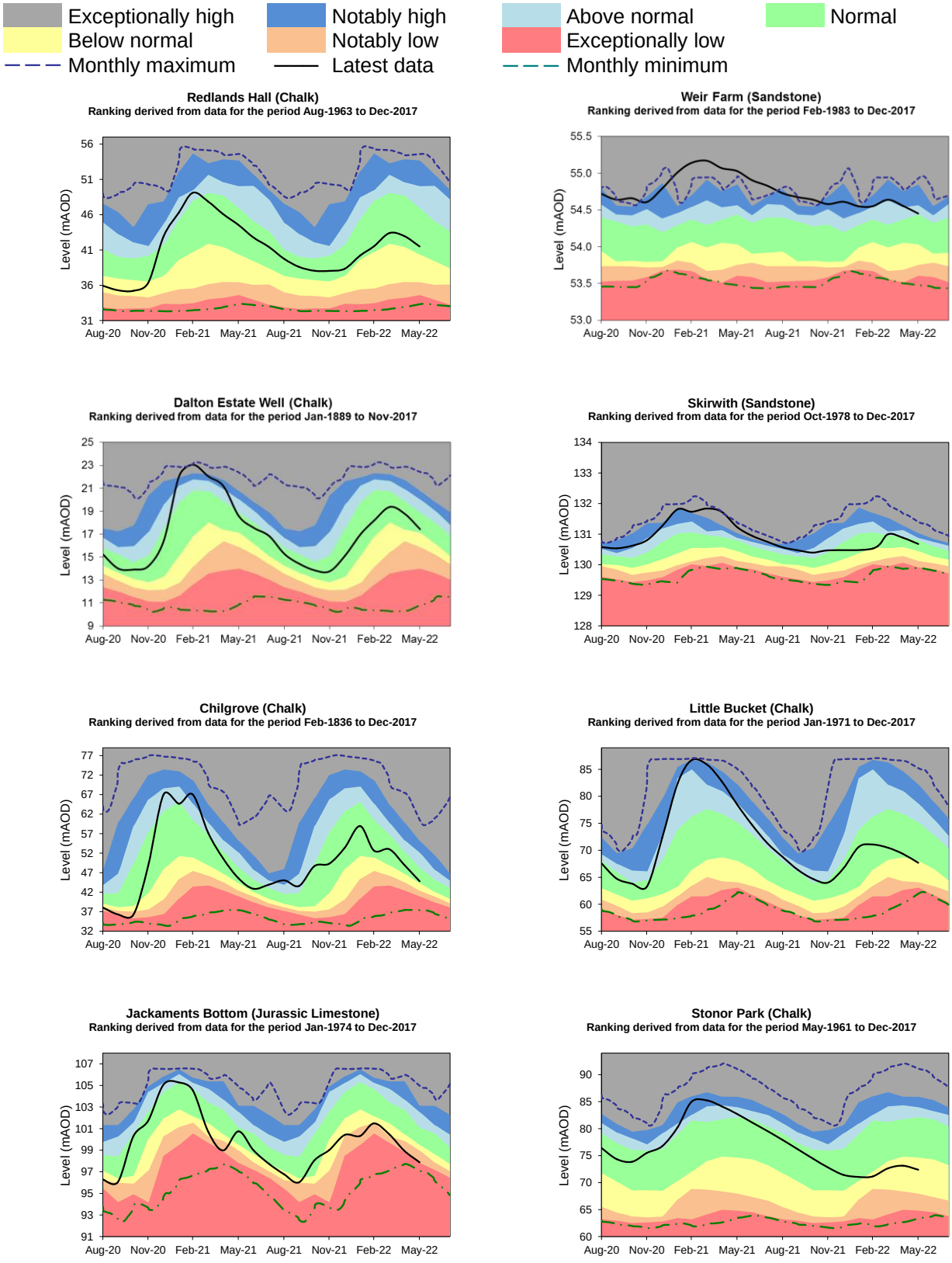
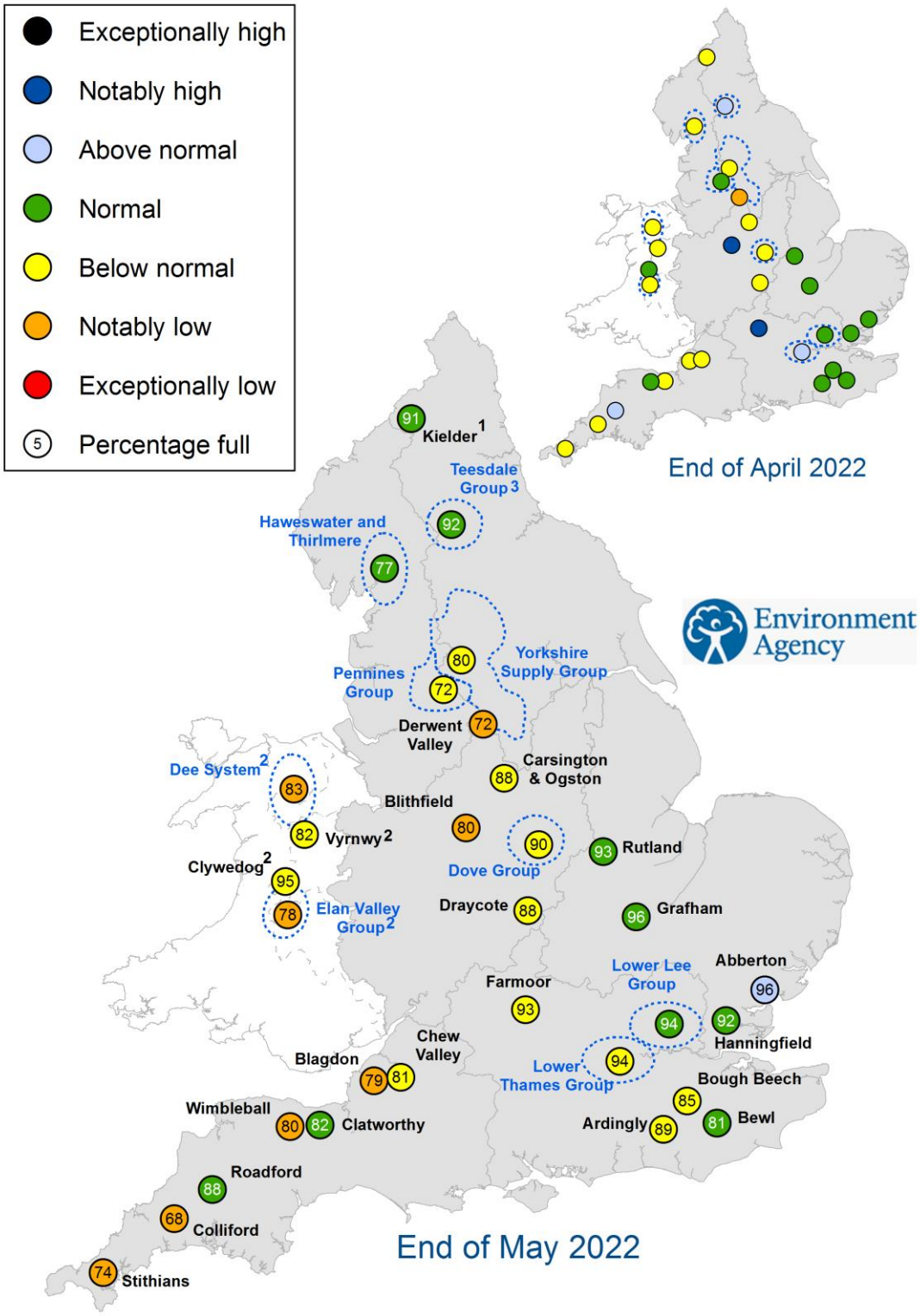


Figure 4.2: Index groundwater level sites for major aquifers. End of month groundwater levels months compared to an analysis of historic end of month levels and long term maximum and minimum levels. (Source: Environment Agency, 2022).

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 April 2022 and May 2022 as a percentage of total capacity and classed relative to an analysis of historic April and May 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, 2022.

Reservoir storage charts

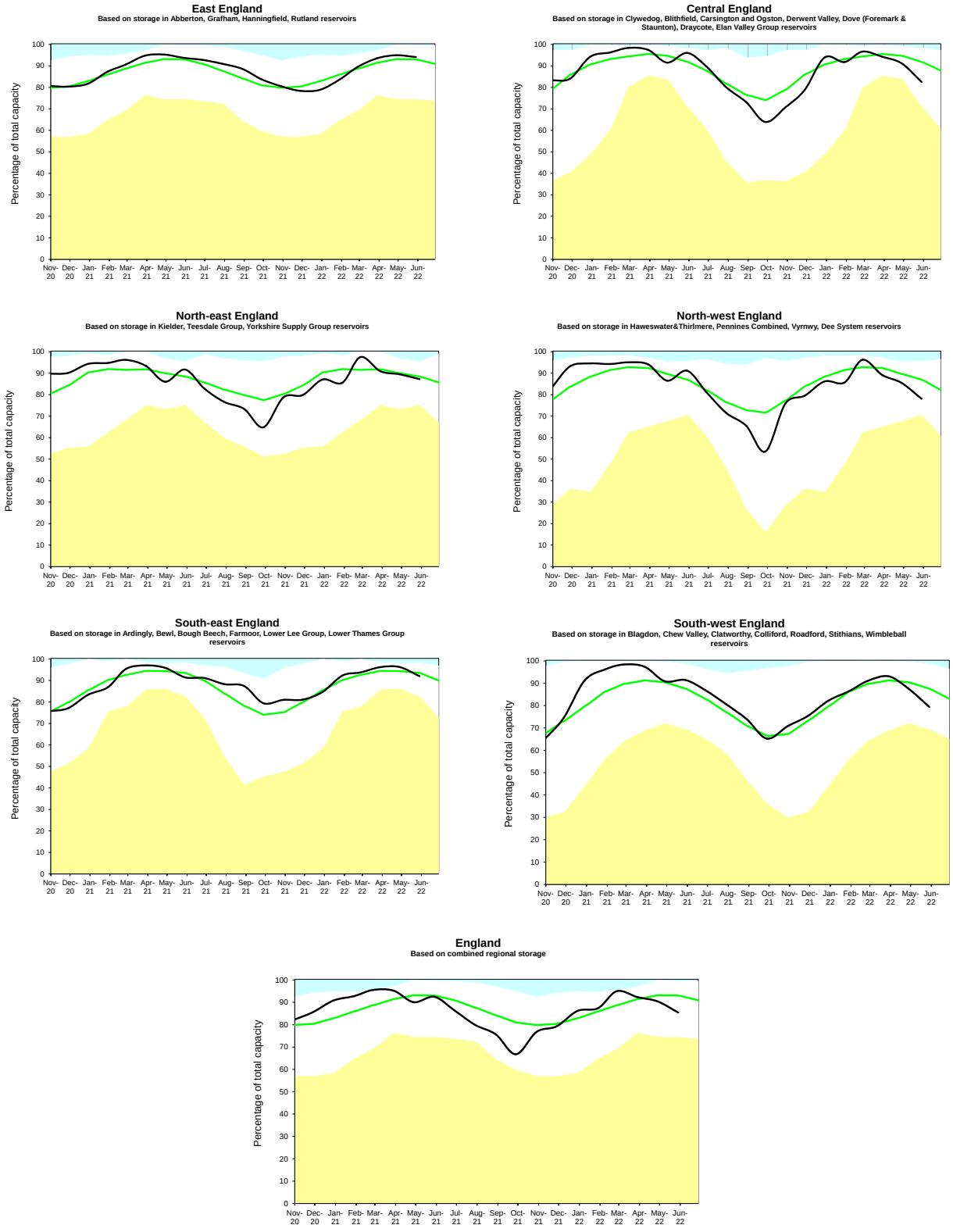


Figure 5.2: Regional reservoir stocks. End of month reservoir stocks compared to long term maximum, minimum and average stocks (Source: Water Companies). Note: Historic records of individual reservoirs/reservoir groups making up the regional values vary in length.

Forward look: river flow

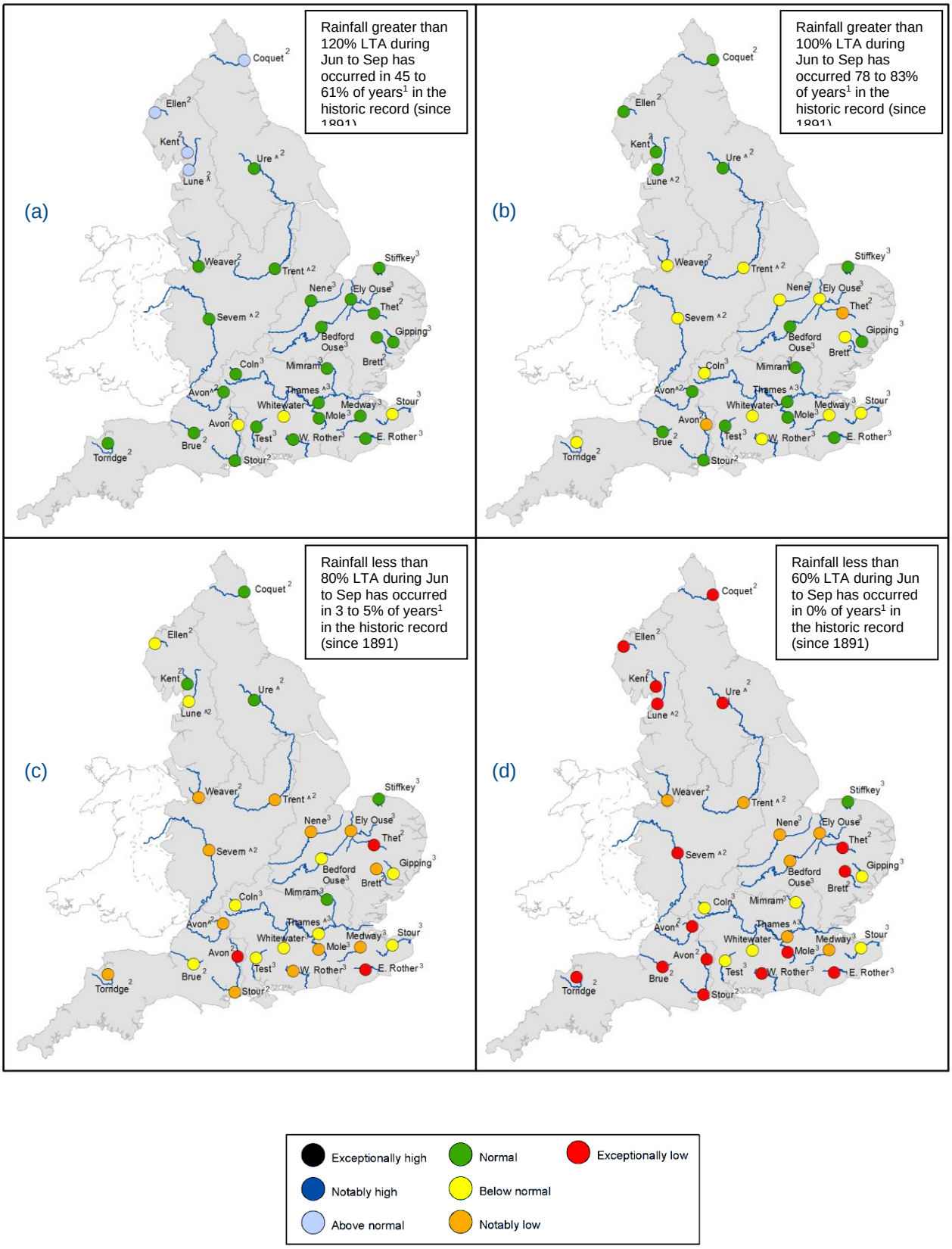


Figure 6.1: Projected river flows at key indicator sites up until the end of September 2022. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between June 2022 and September 2022 (Source: UK Centre for Ecology and Hydrology, Environment Agency)

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

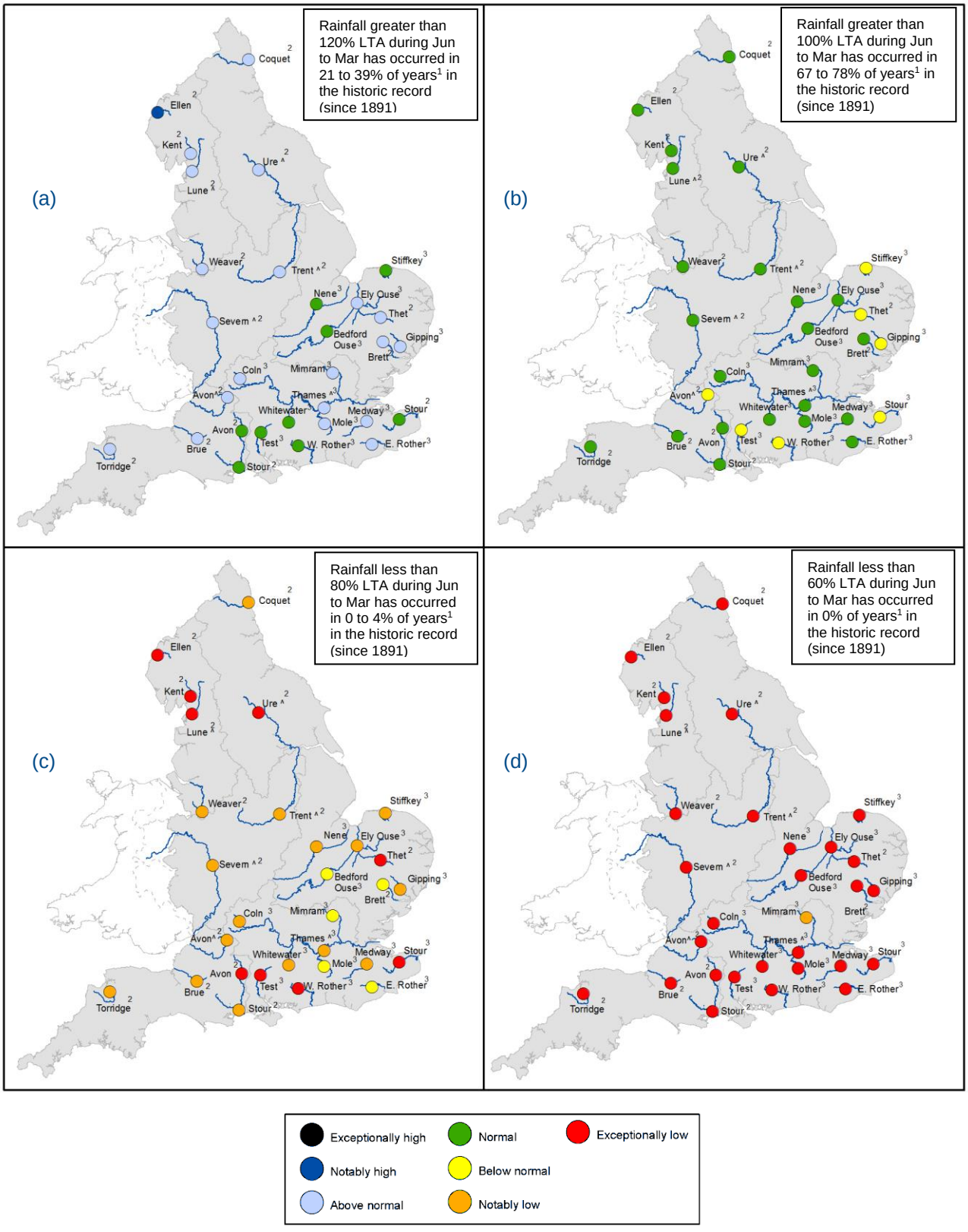


Figure 6.2: Projected river flows at key indicator sites up until the end of March 2023. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between June 2022 and March 2023 (Source: UK Centre for Ecology and Hydrology, Environment Agency)

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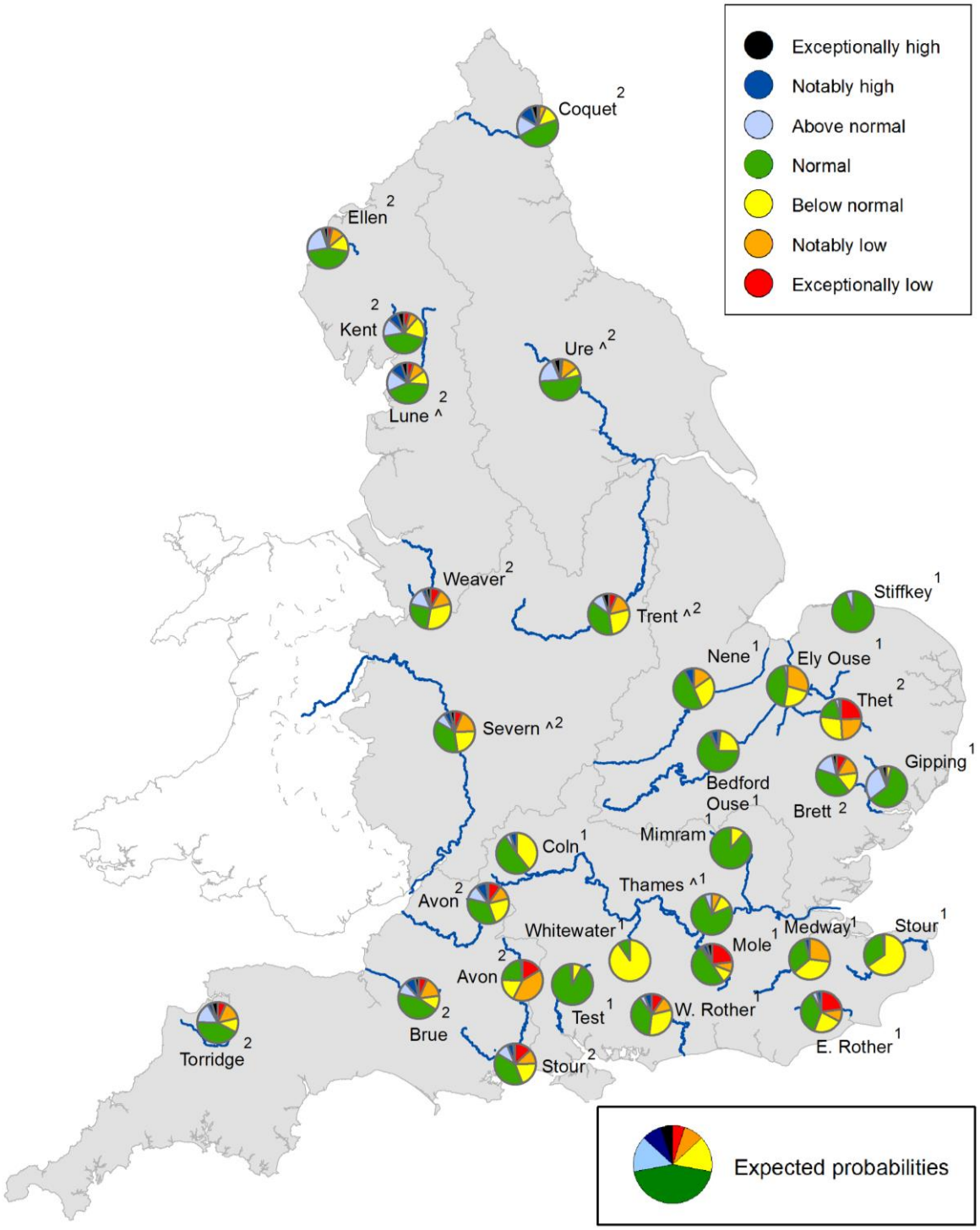

Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are 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 September 2022. 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: UK Centre for Ecology and Hydrology, Environment Agency).

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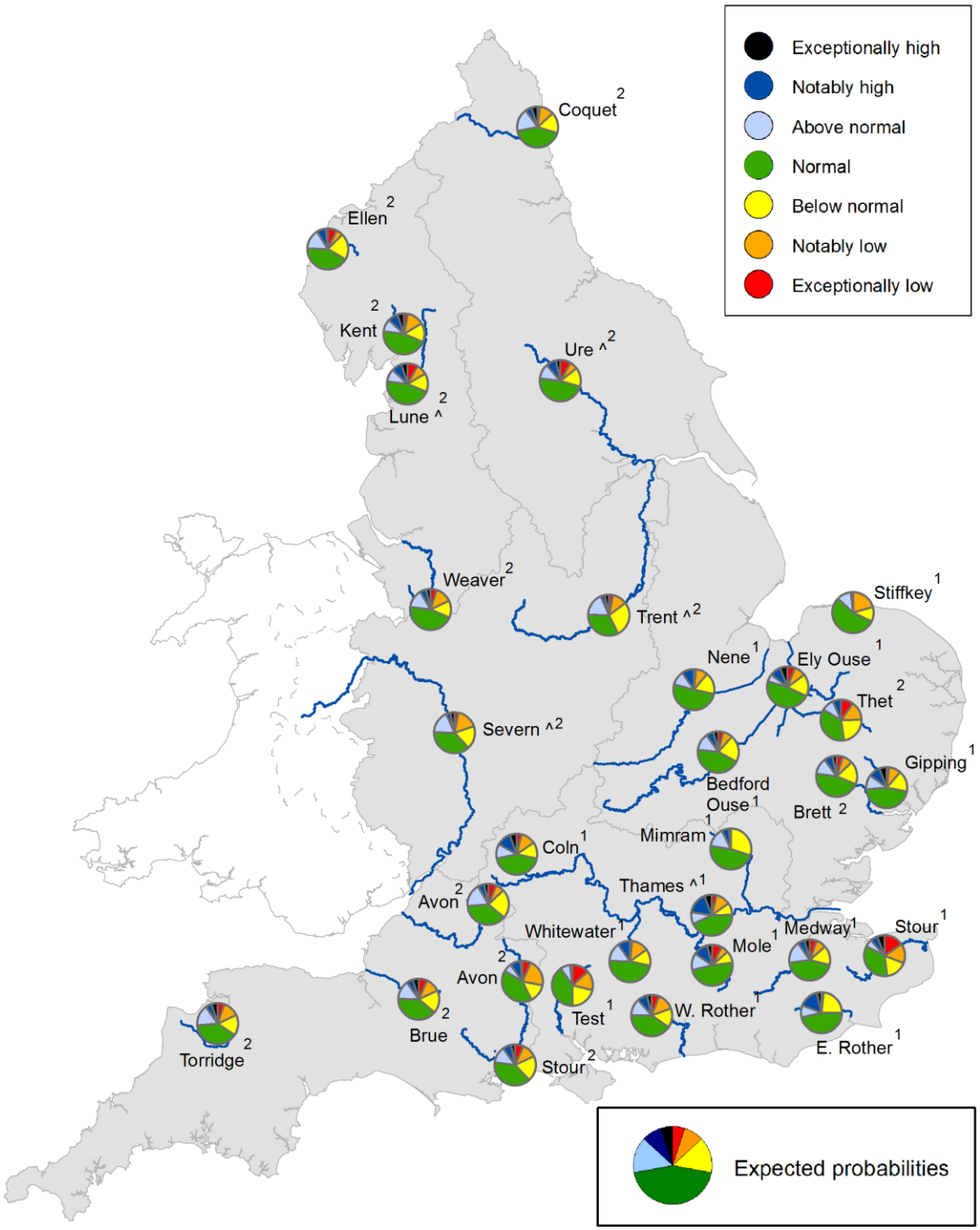

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Figure 6.4: Probabilistic ensemble projections of river flows at key indicator sites up until the end of March 2023. Pie charts indicate probability, based on climatology, of the surface water flow at each site being e.g. exceptionally low for the time of year. (Source: UK Centre for Ecology and Hydrology, Environment Agency).

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^"Naturalised" flows are projected for these sites

Forward look: groundwater

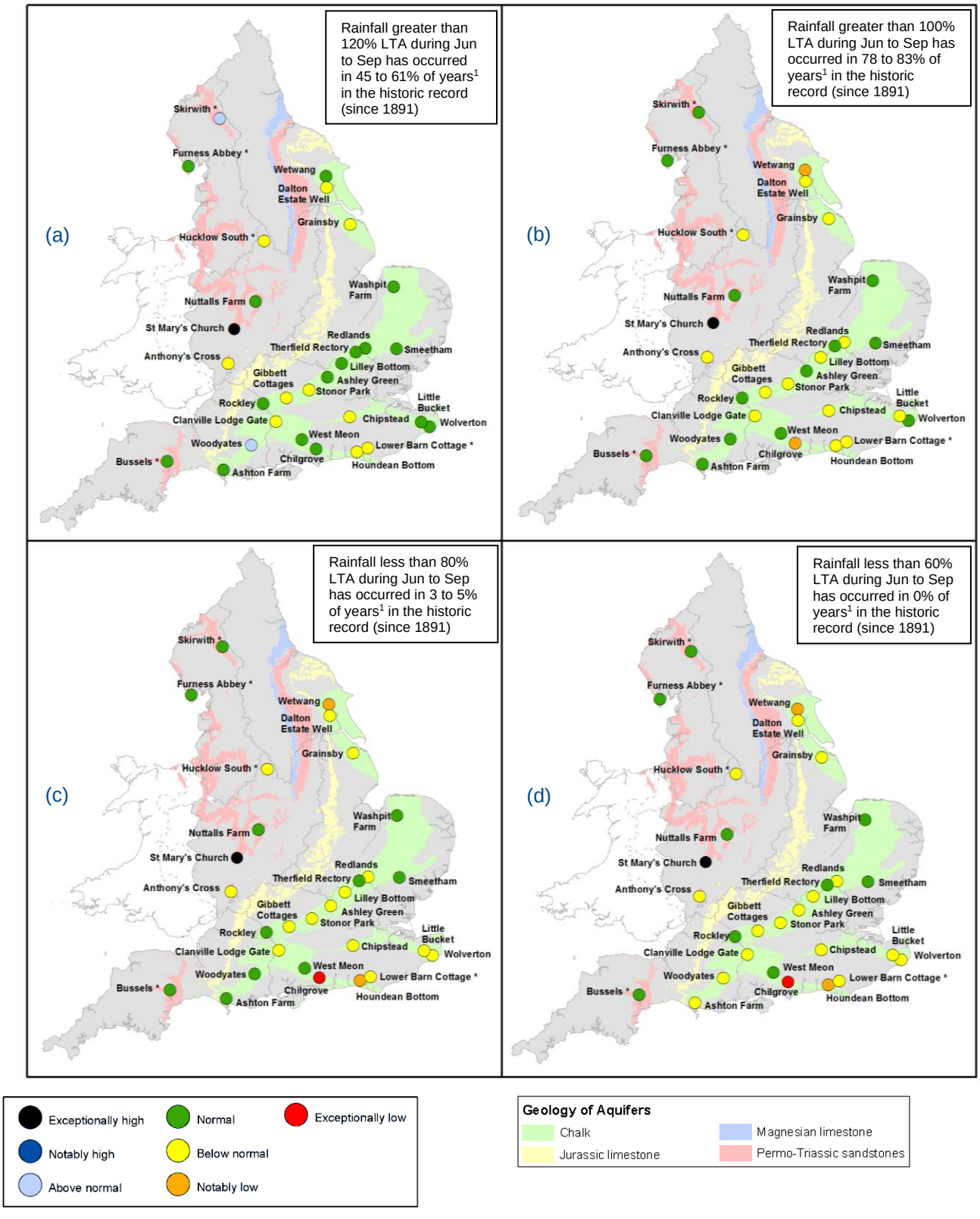

Figure 6.5: Projected groundwater levels at key indicator sites at the end of September 2022. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between June 2022 and September 2022 (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC. Crown copyright all rights reserved. Environment Agency 100024198, 2022.

No data available for Tile Barn Farm

* Projections for these sites are produced by BGS

[1] This range of probabilities is a regional analysis

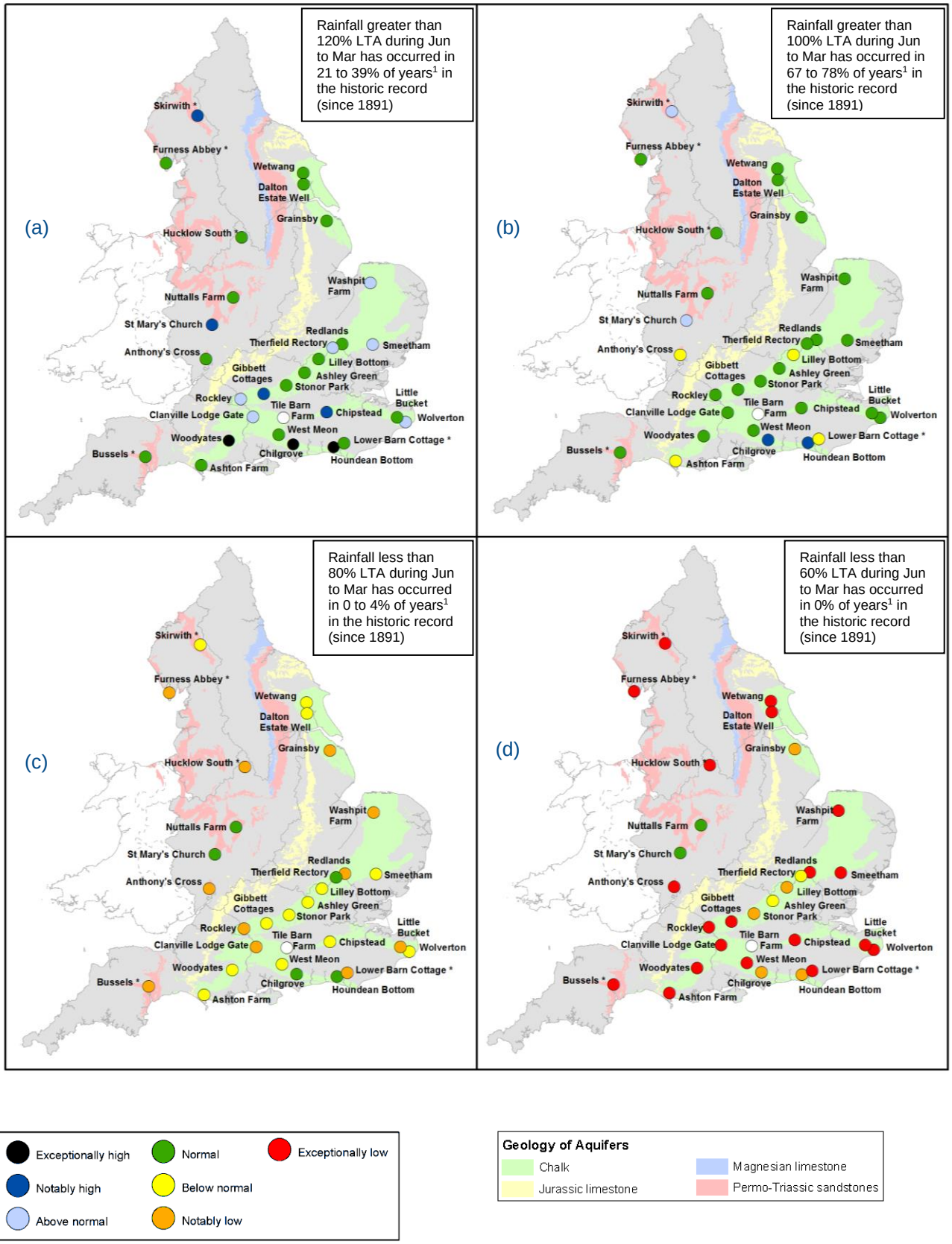

Figure 6.6: Projected groundwater levels at key indicator sites at the end of March 2023. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between June 2022 and March 2023 (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC Crown copyright. All rights reserved. Environment Agency 100024198 2022.

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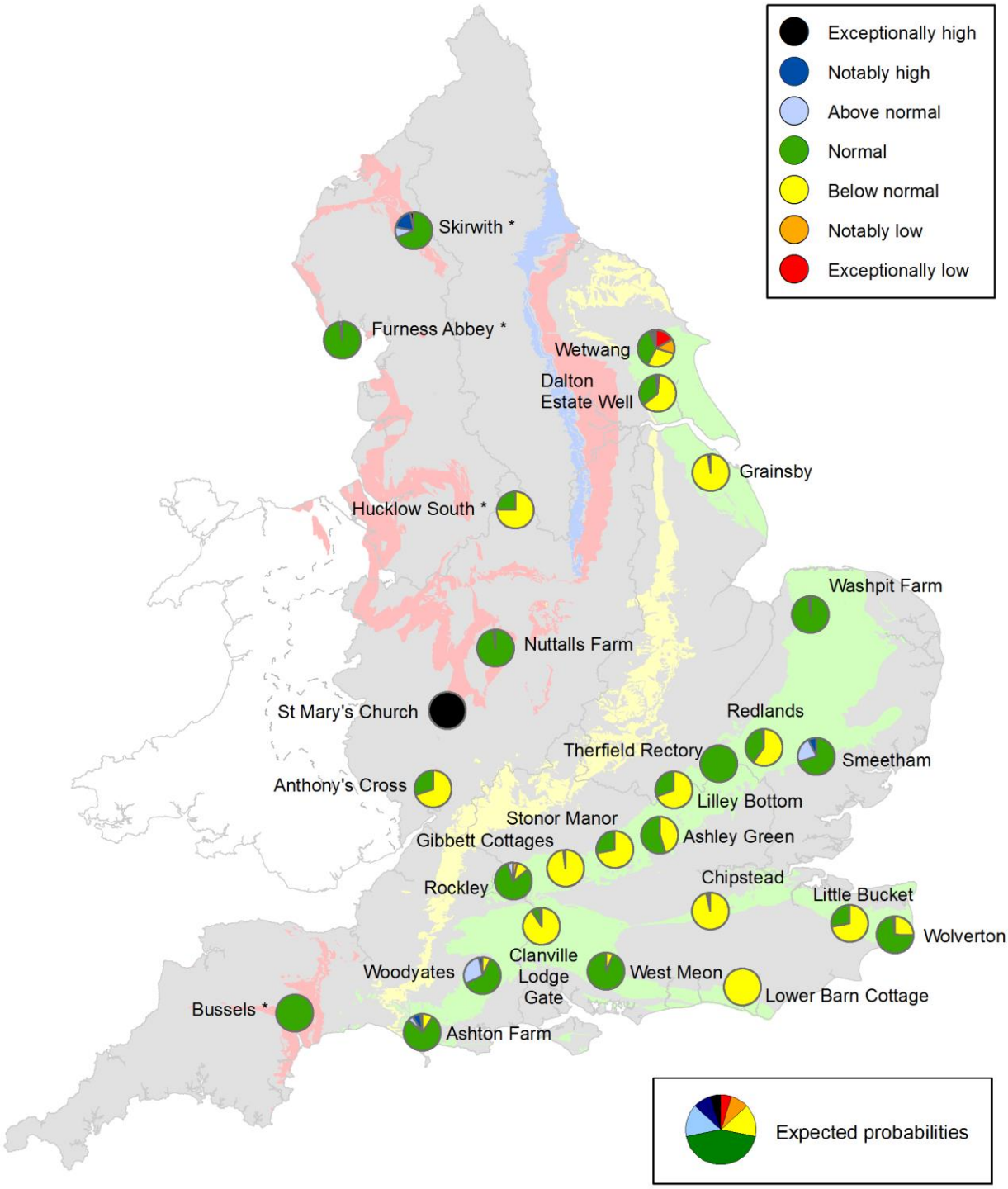

Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are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

Figure 6.7: Probabilistic ensemble projections of groundwater levels at key indicator sites at the end of September 2022. 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, 2022.

** Projections for these sites are produced by BGS*

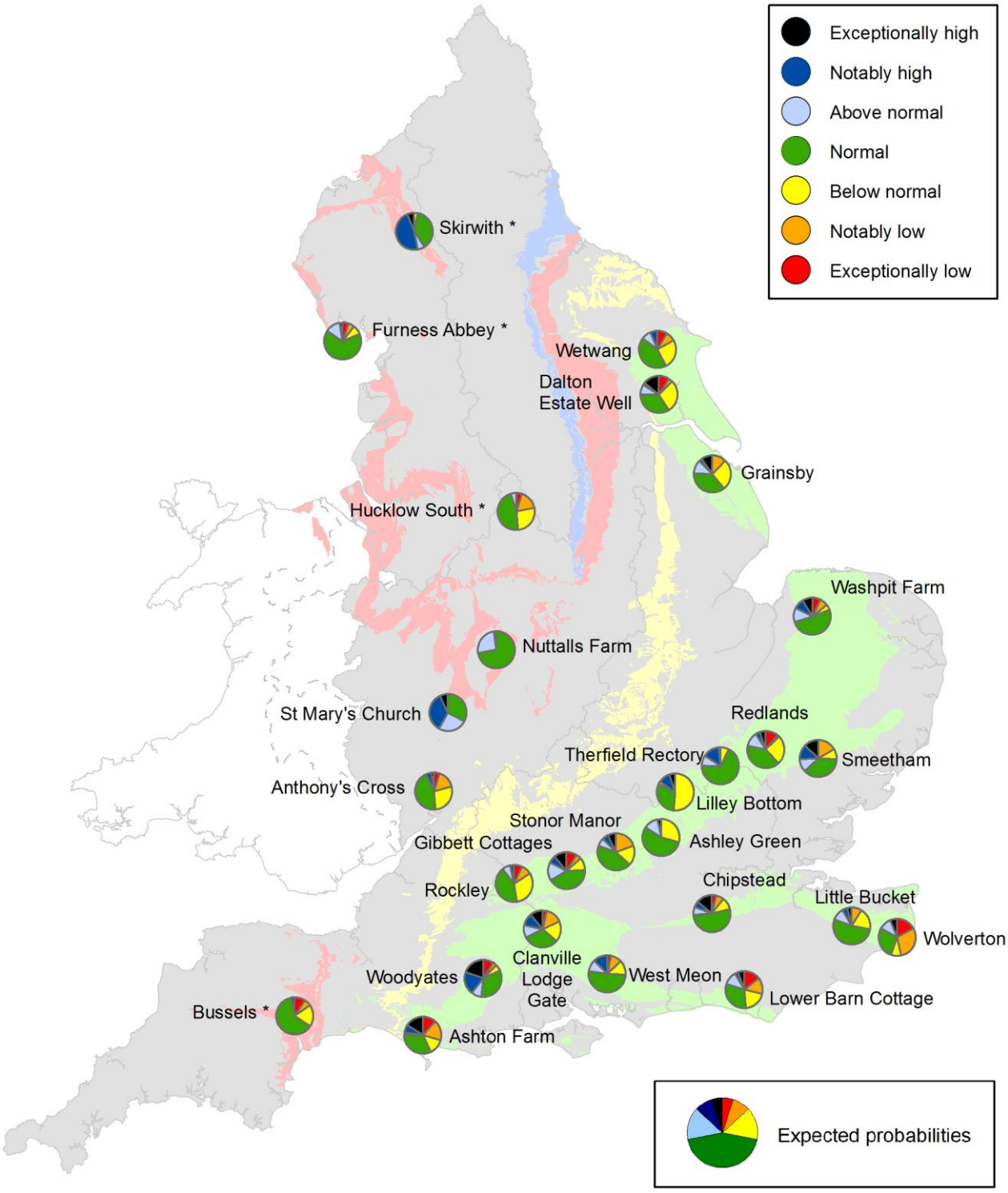

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Figure 6.8: Probabilistic ensemble projections of groundwater levels at key indicator sites at the end of March 2023. Pie charts indicate probability, based on climatology, of the groundwater level at each site being e.g. exceptionally low for the 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, 2022.

* 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