Monthly water situation report

England

Summary – April 2022

April has been a dry month across England with monthly rainfall totals for the majority of areas being classed as below normal or notably low for the time of year. The drier conditions have led to soil moisture deficits increasing across the country and at the end of April soils were generally drier than typically expected for the time of year. River flows decreased in April at almost all the indicator sites we report on, with the majority of sites classed as below normal for the time of year. Groundwater levels lowered during April but remain classed as normal at the majority of sites for the time of year. Reservoir stocks in April decreased at nearly three quarters of the reservoirs and reservoir groups we report on.

Rainfall

The April rainfall total for England was 25mm which represents 44% of the 1961-1990 long term average (LTA) (44% of the 1991-2020 LTA). Around two thirds of catchments received less than half the average rainfall during April, with the lowest monthly totals seen across eastern England. (Figure 1.1)

April rainfall totals were classed as normal at only a few catchments across the England. The majority of catchments were classed below normal or notably low with four catchments in eastern England exceptionally low for the time of year.

The three month cumulative totals were a mixed picture across the country. The majority of catchments were classed as normal however parts of southern and eastern England were below normal or notably low. In contrast some areas in north-west England were above normal. Six month cumulative rainfall totals showed exceptionally low rainfall across several catchments in south-west and south-east England. The Axe catchment in south-west England recorded the driest six months to April on record (using records since 1891) with several other catchments across southern England also within the top ten driest six months to April on record (using records since 1891). (Figure 1.2)

At a regional scale, April rainfall totals were notably low for eastern, central and south-east England with south-west, north-west and north-east England classified as below normal. (Figure 1.3)

Soil moisture deficit

Due to the dry conditions throughout April, soil moisture deficits increased across the country. (Figure 2.1)

End of April soil moisture deficits (SMD) were greater than the long term average (LTA) for the time of year for most of the country meaning soils were drier than would be typically be expected, although some soils across northern England remain closer to the LTA than elsewhere (Figure 2.2).

River flows

Following a dry April across England, monthly mean river flows decreased at all but two of the indicator sites we report on compared to the previous month. Nearly a third of sites across England remained classed as normal for the time of year. More than half the sites were classed as below normal with six sites in the central and south-west England notably low for the time of year. (Figure 3.1)

With the exception of the River Dove in central England and the South Tyne in the north-east which remained classed as normal all other regional index sites monthly mean flows were classed as below normal for the time of year, with the River Exe at Thorverton being notably low. (Figure 3.2)

Groundwater levels

Groundwater levels decreased at over four-fifths of the reported indicator sites during April. End of month levels were classed as normal for the time of year at more than half of the indicator sites we report on. Groundwater levels at a fifth of sites were classed as below normal or lower for April with Jackaments Bottom in the Jurassic limestone classed as notably low. (Figures 4.1).

April groundwater levels at all the major aquifer index sites were classed as normal with the exception of below normal in the chalk at Stonor Park and notably low in the Jurassic limestone at Jackaments Bottom. (Figure 4.2).

Reservoir storage

End of April reservoir stocks decreased at nearly three-quarters of the reservoirs and reservoir groups we report on. The largest decreases of 14% and 12% of total capacity were recorded respectively at the Stithians and Clatworthy reservoirs in south-west England. The largest increase of 8% of total capacity was recorded at the Abberton reservoir which supplies eastern England. (Figure 5.1).

End of month reservoir stocks were classed as normal or higher for the time of year at over half of reported reservoir sites. Fourteen reservoirs or reservoir groups were classed as below normal for the time of year, and Derwent Valley in central England was notably low (Figure 5.1).

At a regional scale, total reservoir stocks ranged from 85% in north-west England to 96% in south-east England. Total reservoir stocks for England were at 90% of total capacity at the end of April (Figure 5.2).

Forward look

May has had a dry start, and many areas will continue to see largely fine, sunny conditions as the month progresses, although there may be rain in the northwest that begins to move southeast. Through the middle of May coastal areas will feel cooler with low cloud and fog, while fine and dry conditions dominate in southern and eastern areas. The north is likely to see mixed conditions as a change in pressure brings spells of rain. Widespread showery conditions are expected for much of the UK towards the end of May, although drier spells are likely in the south with warm temperatures.

From May to July, the 3-month period has a higher than normal chance of being hot, with heatwaves more likely than usual toward the end of the period. The period is likely to have near average rainfall, although spells of wetter weather may bring heavy showers or thunderstorms. [1].

Projections for river flows at key sites[2]

By the end of September 2022 and March 2023 the majority of modelled sites have a greater than expected chance of cumulative river flows being below normal or lower 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 the majority of modelled sites in the Chalk 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 below 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

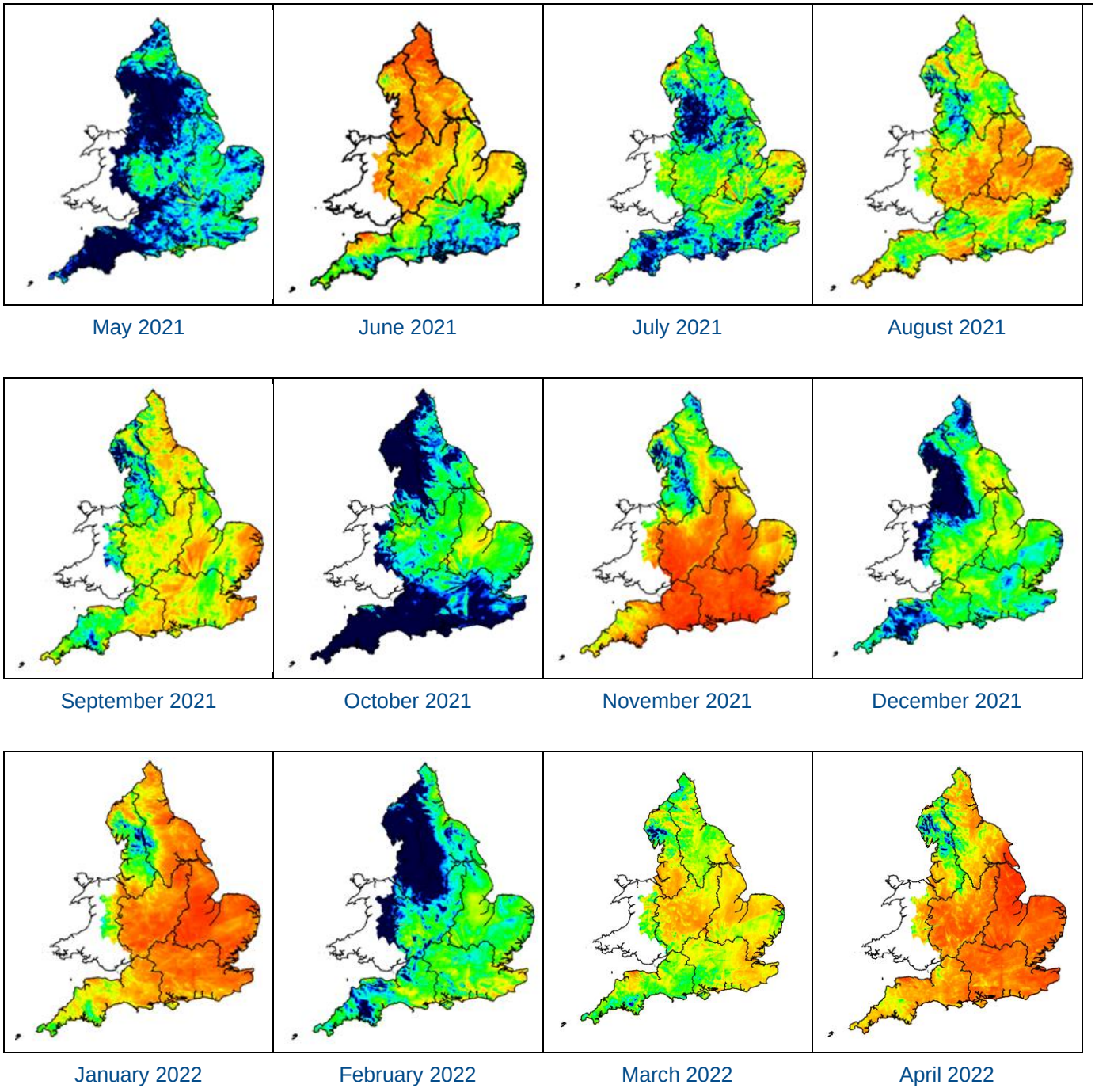


Figure 1.1: Monthly rainfall across England and Wales for the past 12 months. UKPP radar data (Source: Met Office © Crown Copyright, 2021). Note: Radar beam blockages in some regions may give anomalous totals in some areas. Crown copyright. All rights reserved. Environment Agency, 100024198, 2021.

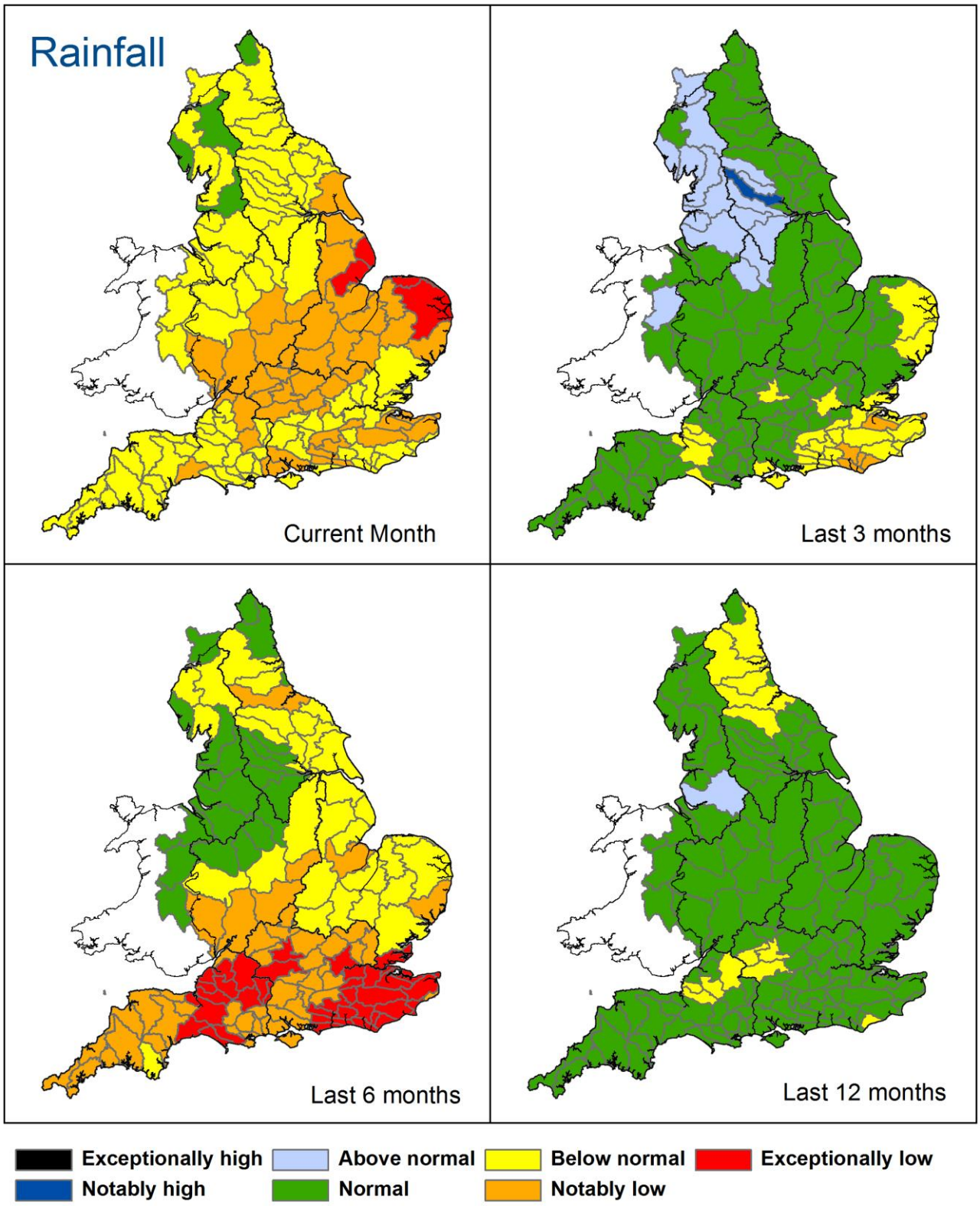


Figure 1.2: Total rainfall for hydrological areas across England for the current month (up to 30 April), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. HadUK data based on the Met Office 1km gridded rainfall dataset derived 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

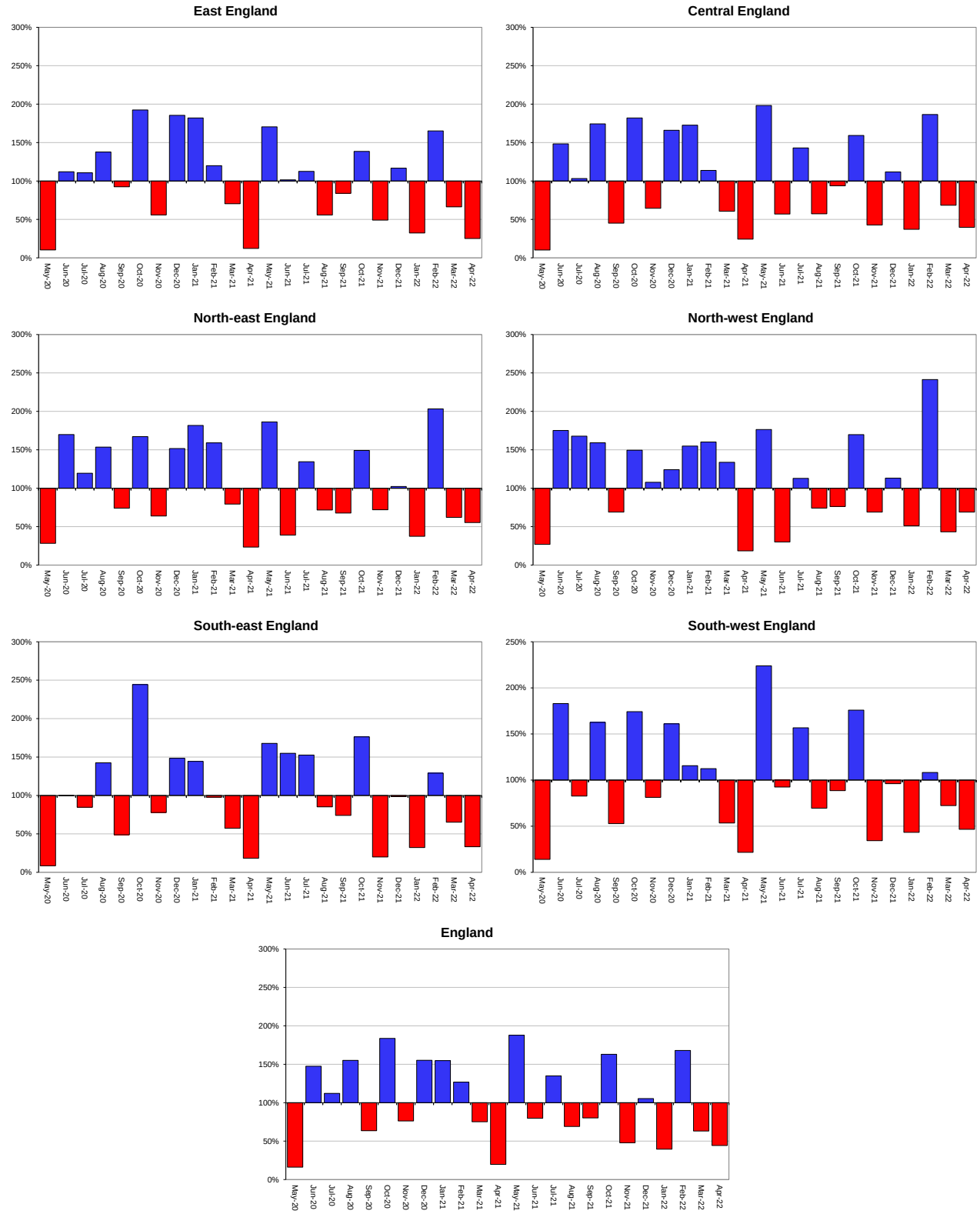


Figure 1.3: Monthly rainfall totals for the past 24 months as a percentage of the 1961 to 1990 long term average for each region and for England. HadUK rainfall data. (Source: Met Office © Crown Copyright, 2022).

Soil moisture deficit

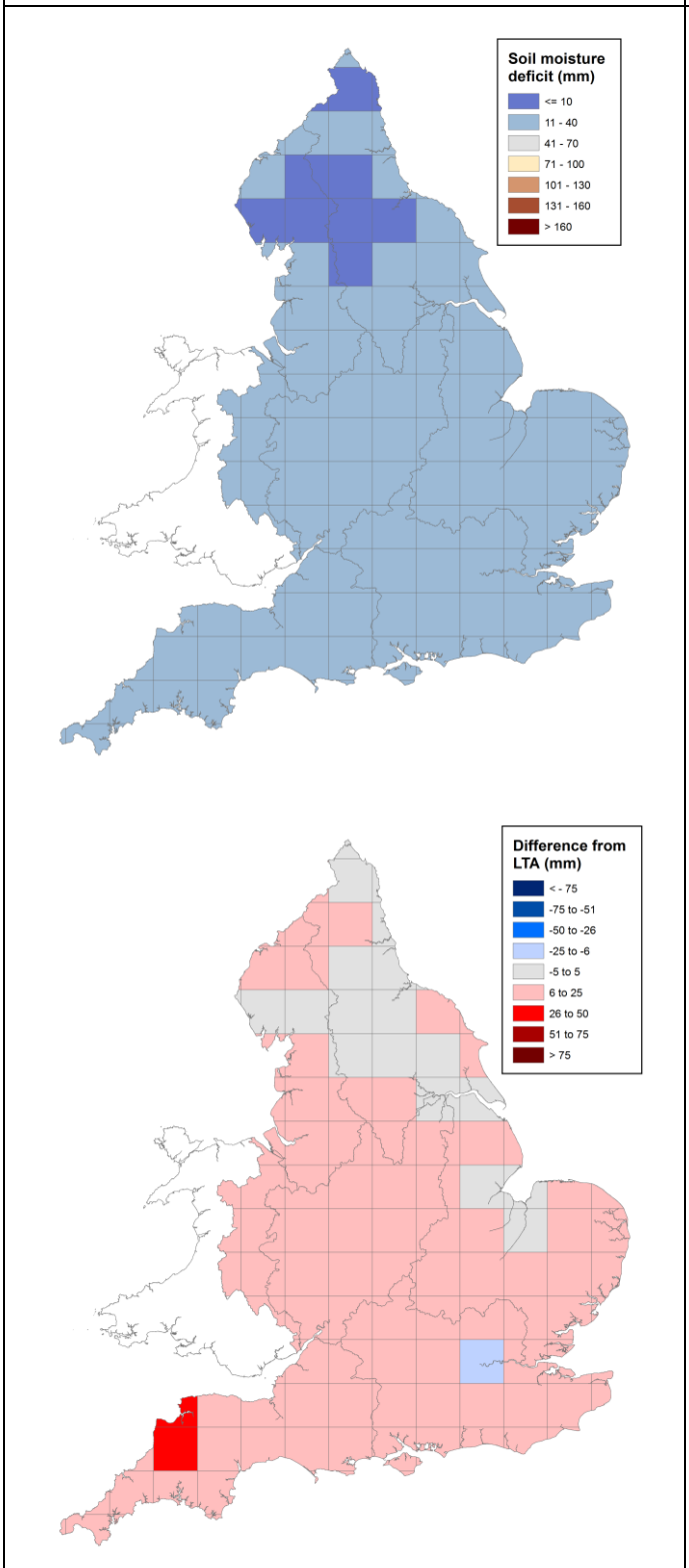
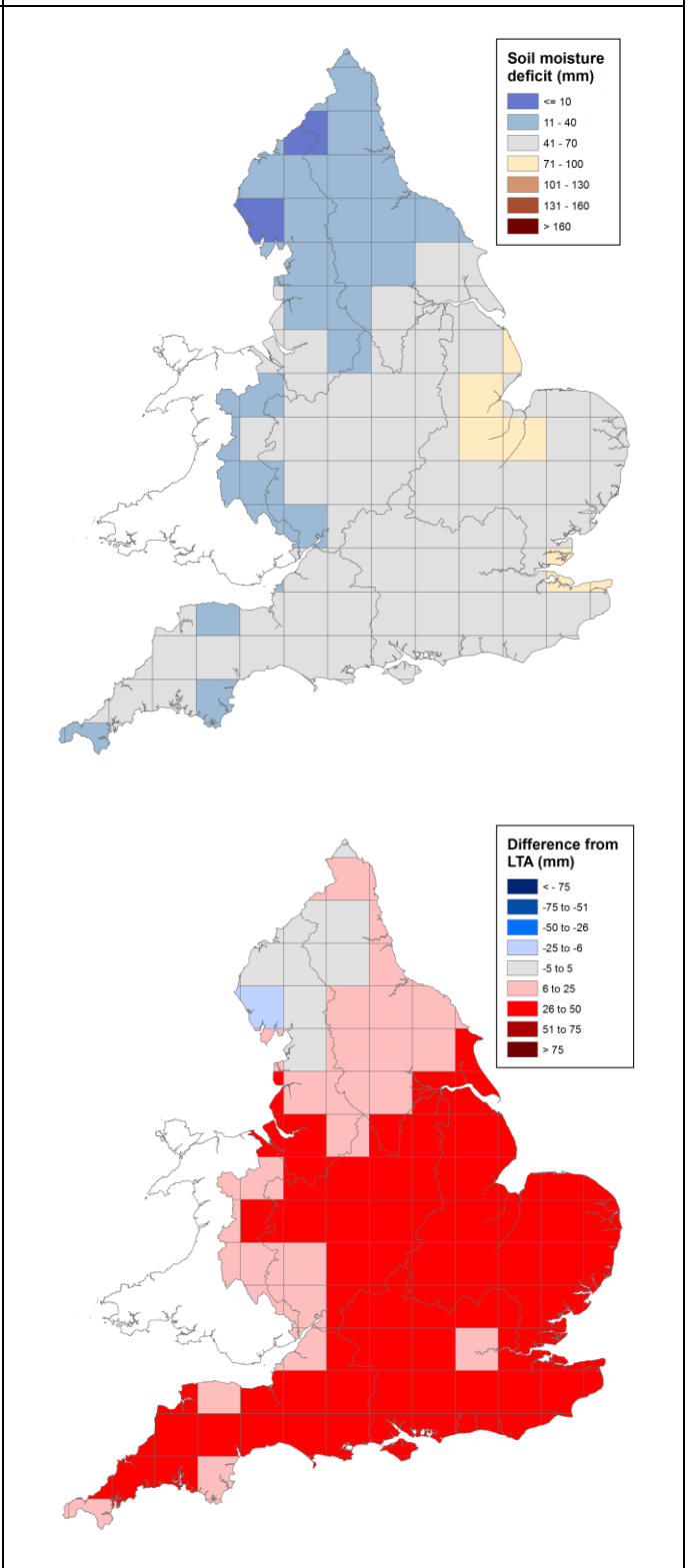
End of March 2022[1]	End of April 2022[2]
	

Figure 2.1: Soil moisture deficits for weeks ending 29 March 2022 [1] (left panel) and 3 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, 2022). Crown copyright. All rights reserved. Environment Agency, 100024198, 2022

Soil moisture deficit charts

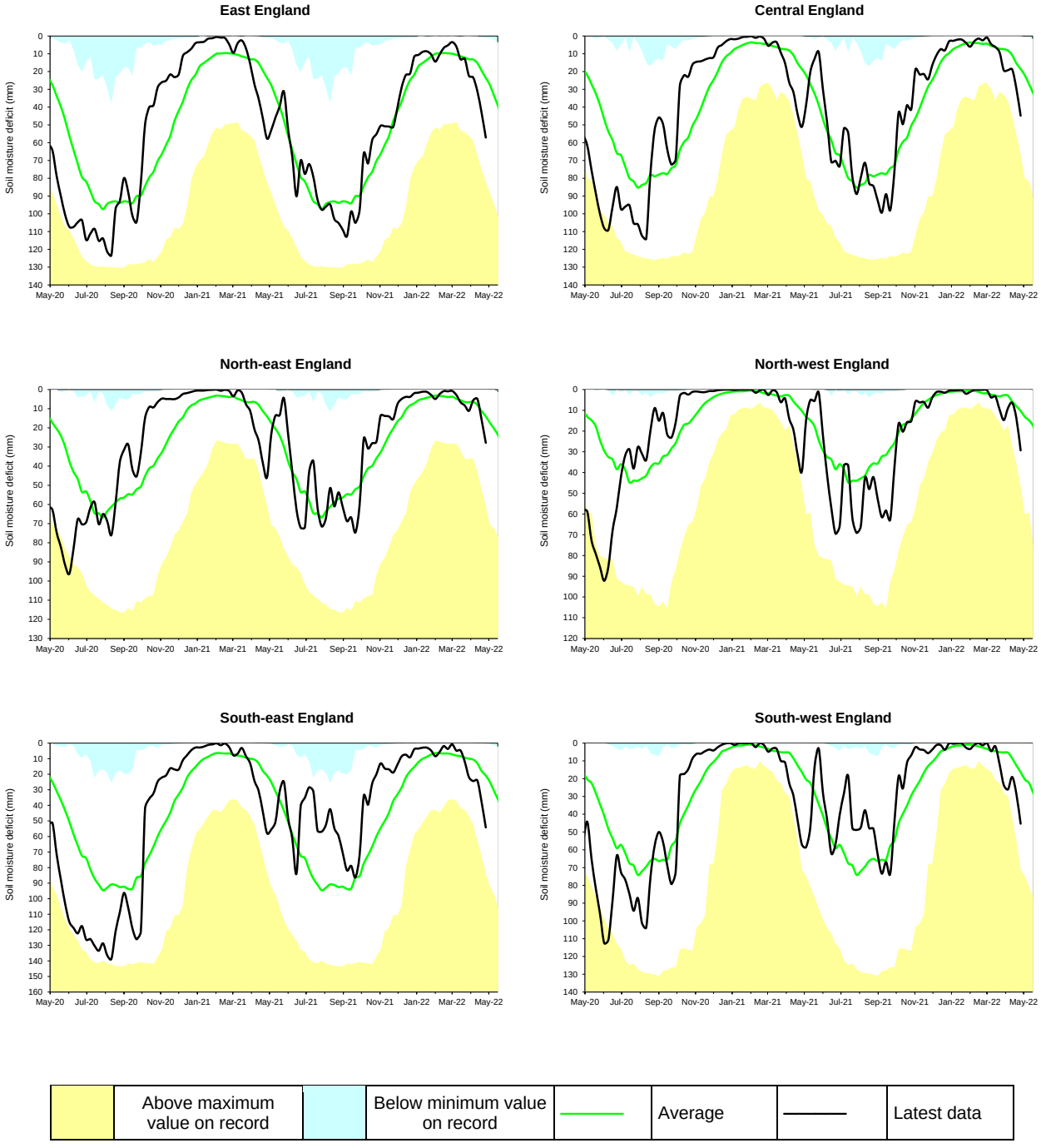
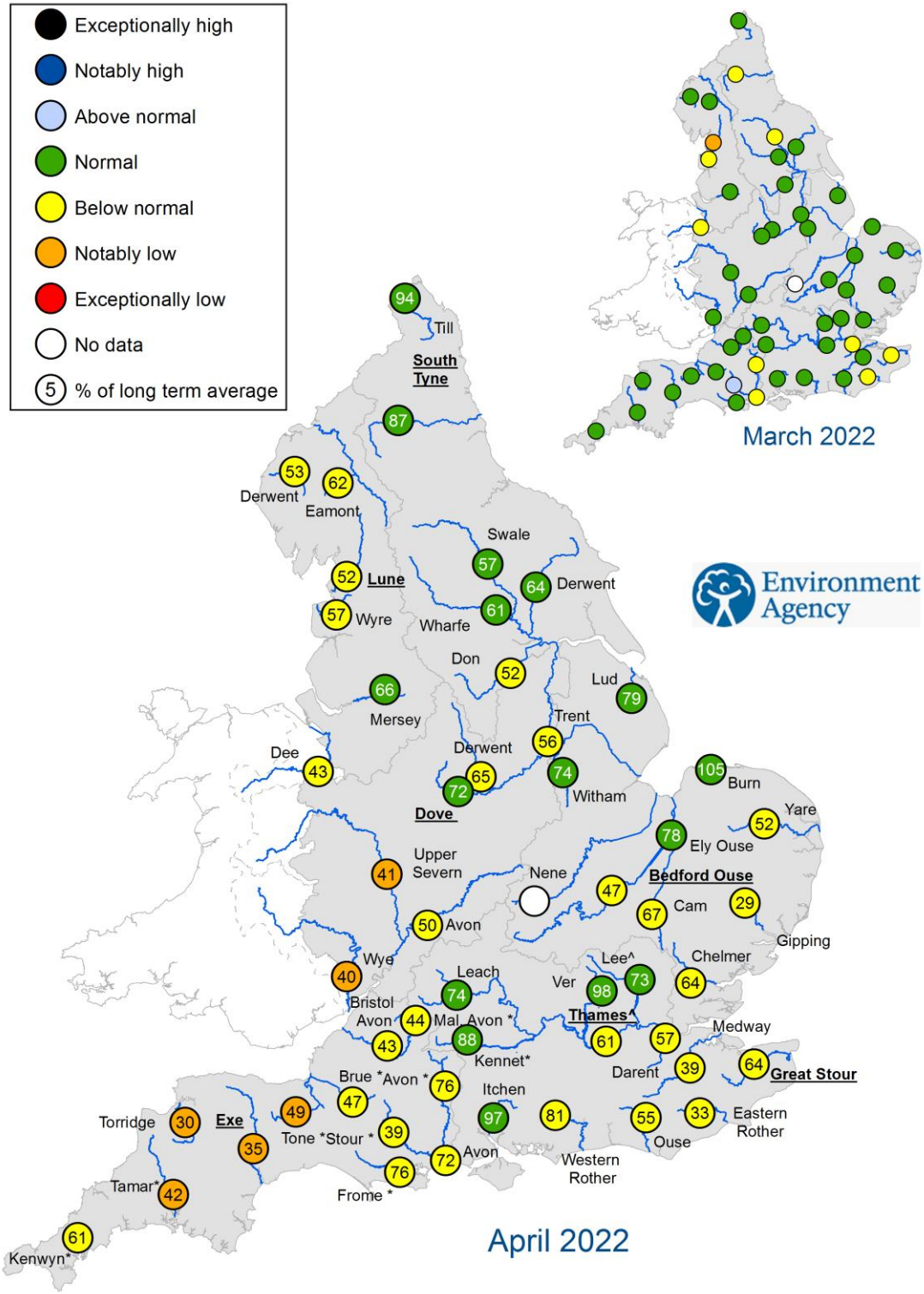


Figure 2.2: Latest soil moisture deficits for all geographic regions compared to maximum, minimum and 1961 to 90 long term average. Weekly MORECS data for real land use. (Source: Met Office © Crown Copyright, 2022).

River flows



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

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

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

River flow charts

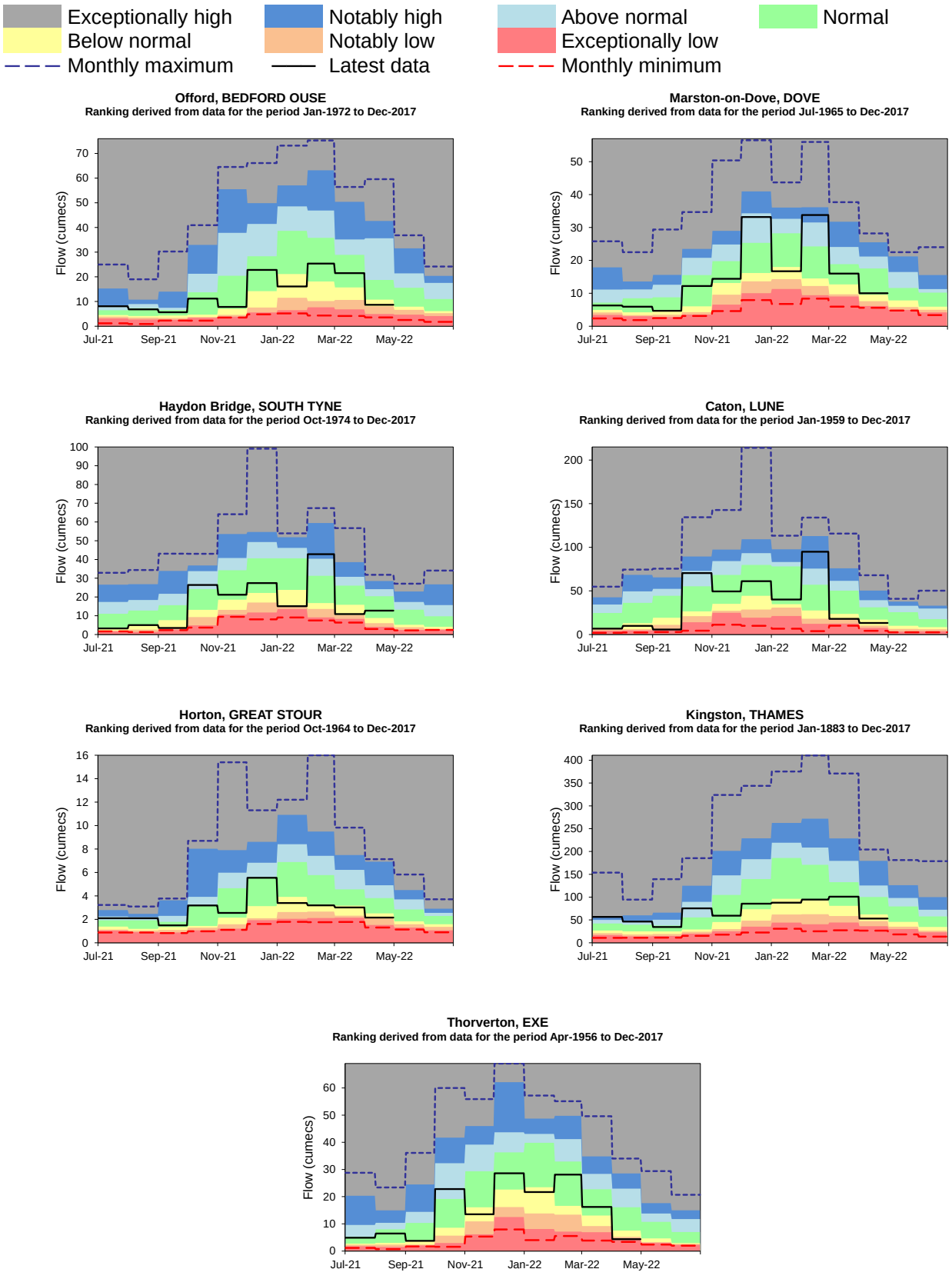
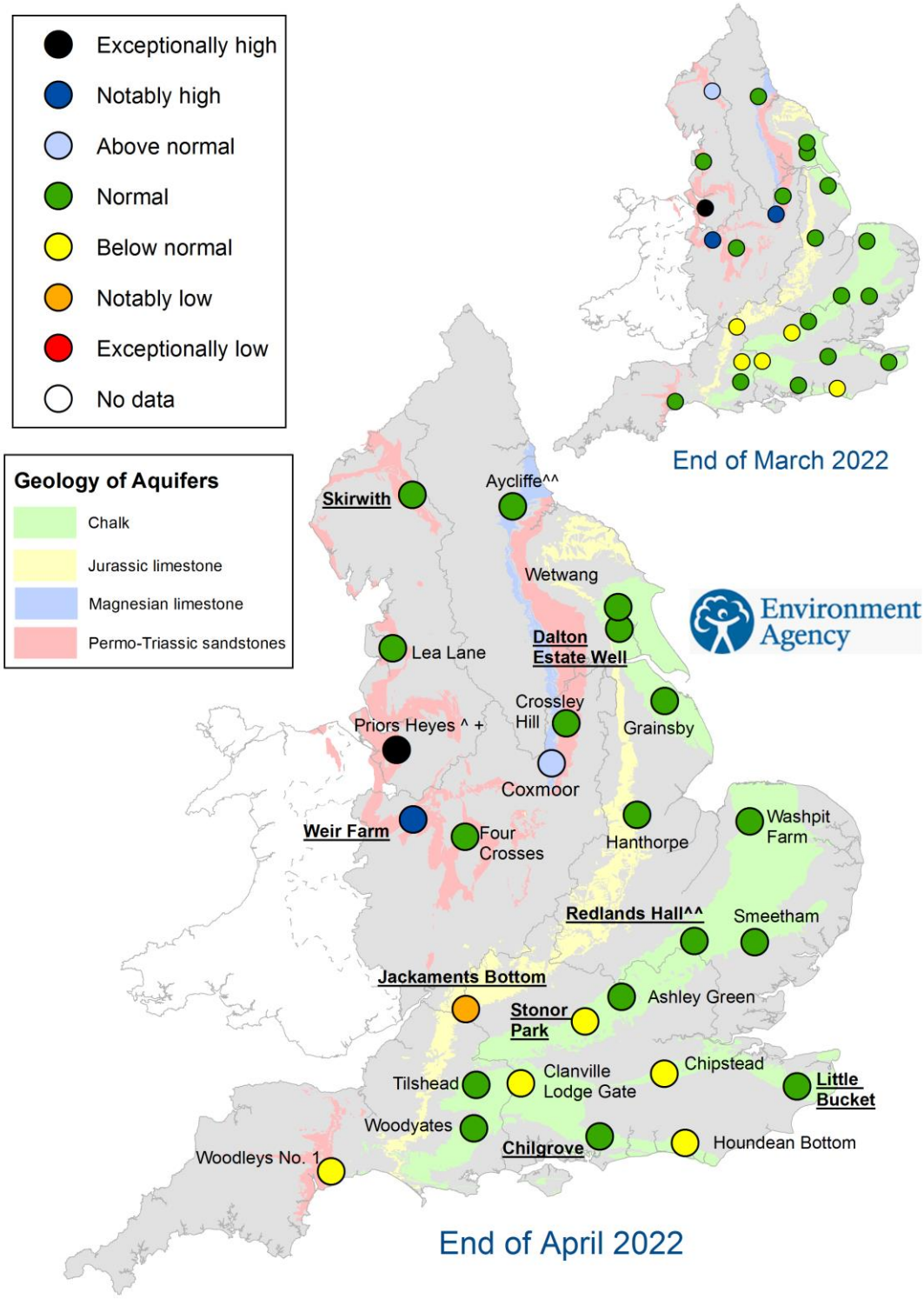


Figure 3.2: Index river flow sites for each geographic region. Monthly mean flow compared to an analysis of historic monthly mean flows, long term maximum and minimum flows. (Source: Environment Agency).

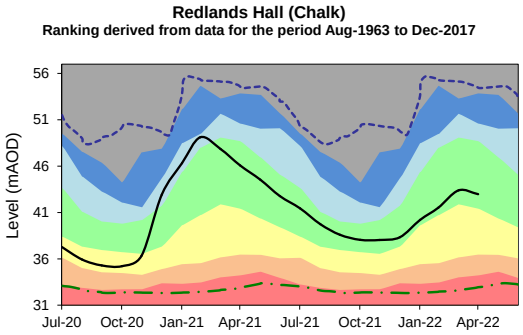
Groundwater levels

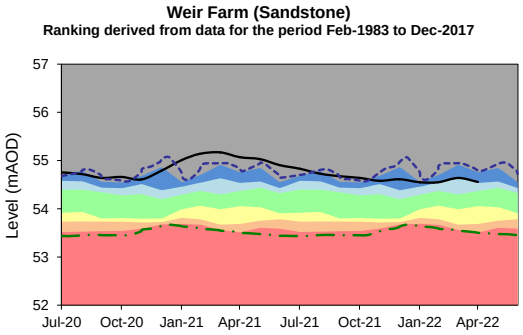


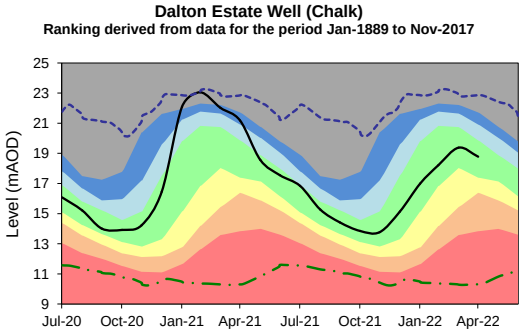
^ The level at Priors Heyes remains high compared to historic levels because the aquifer is recovering from the effects of historic abstraction
^^ Sites are manually dipped at different times during the month. They may not be fully representative of levels at the month end
+/- End of month groundwater 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

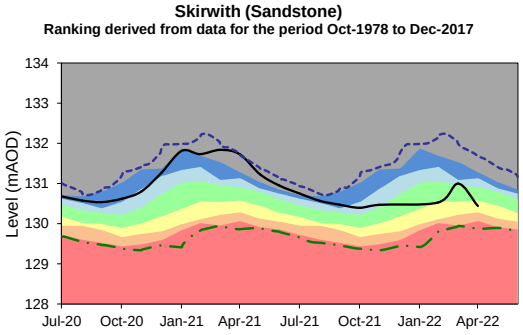
Figure 4.1: Groundwater levels for indicator sites at the end of March 2022 and April 2022, classed relative to an analysis of respective historic March and April levels (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2022.

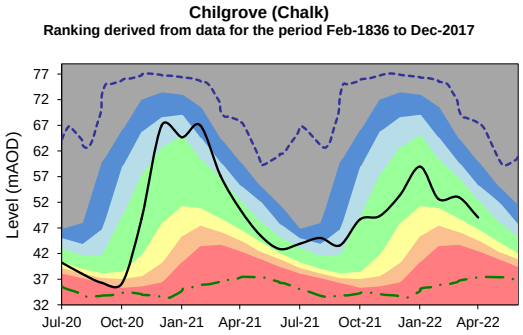
Groundwater level charts

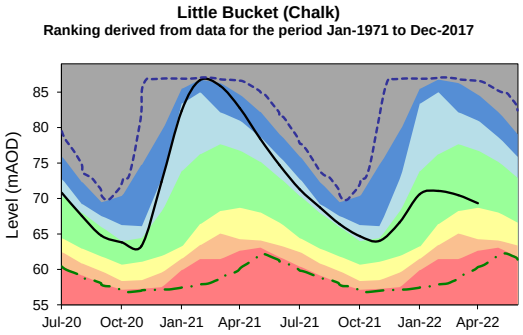


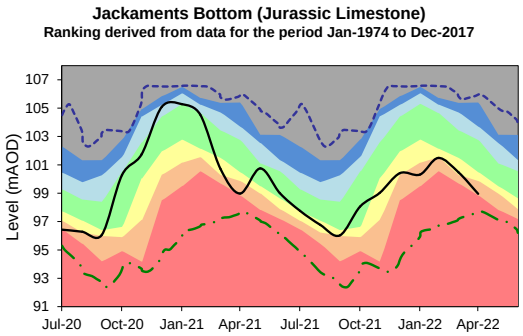












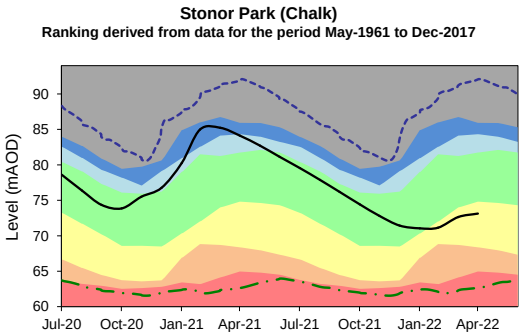
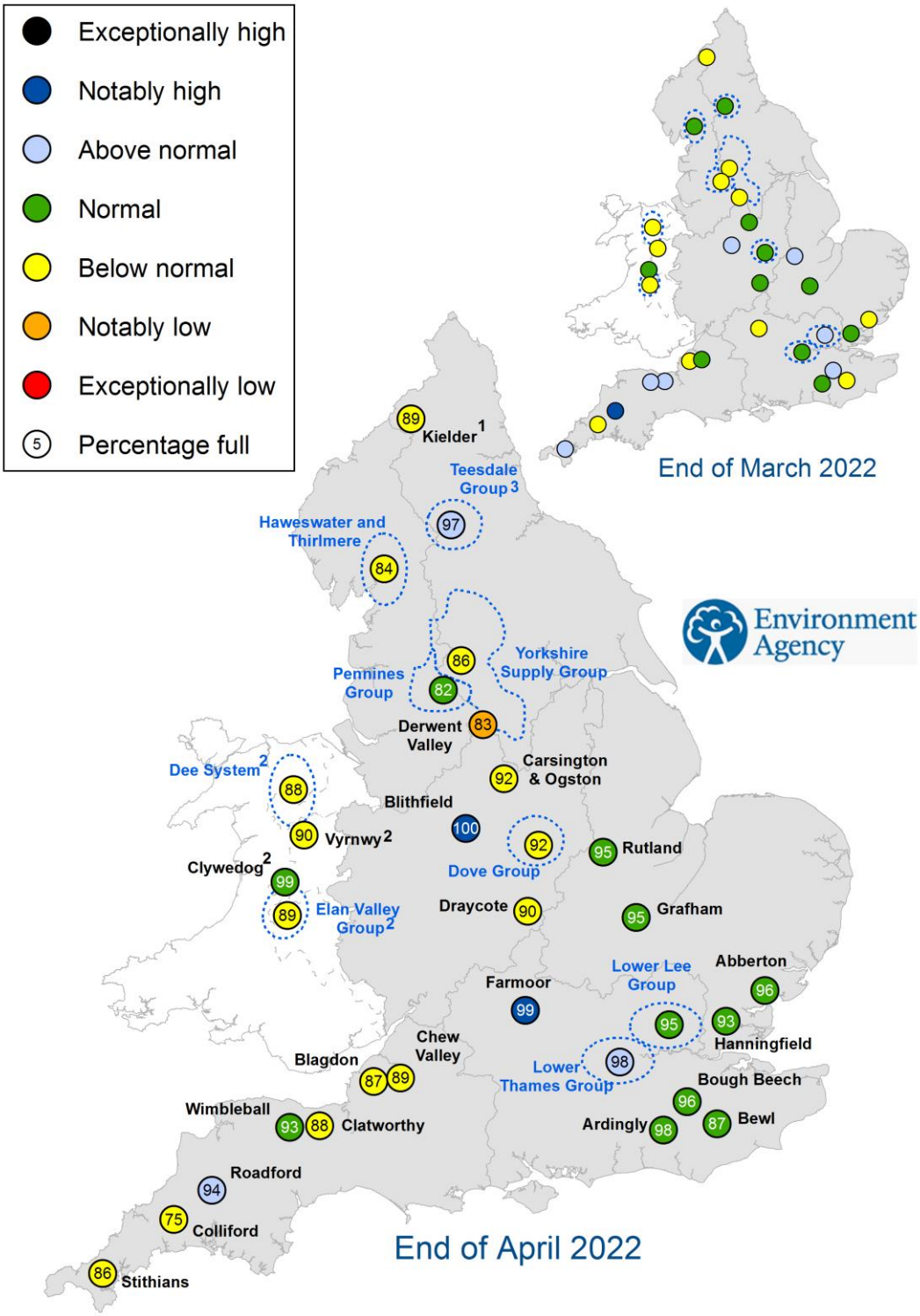


Figure 4.2: Index groundwater level sites for major aquifers. End of month groundwater levels months compared to an analysis of historic end of month levels and long term maximum and minimum levels. (Source: Environment Agency, 2021).

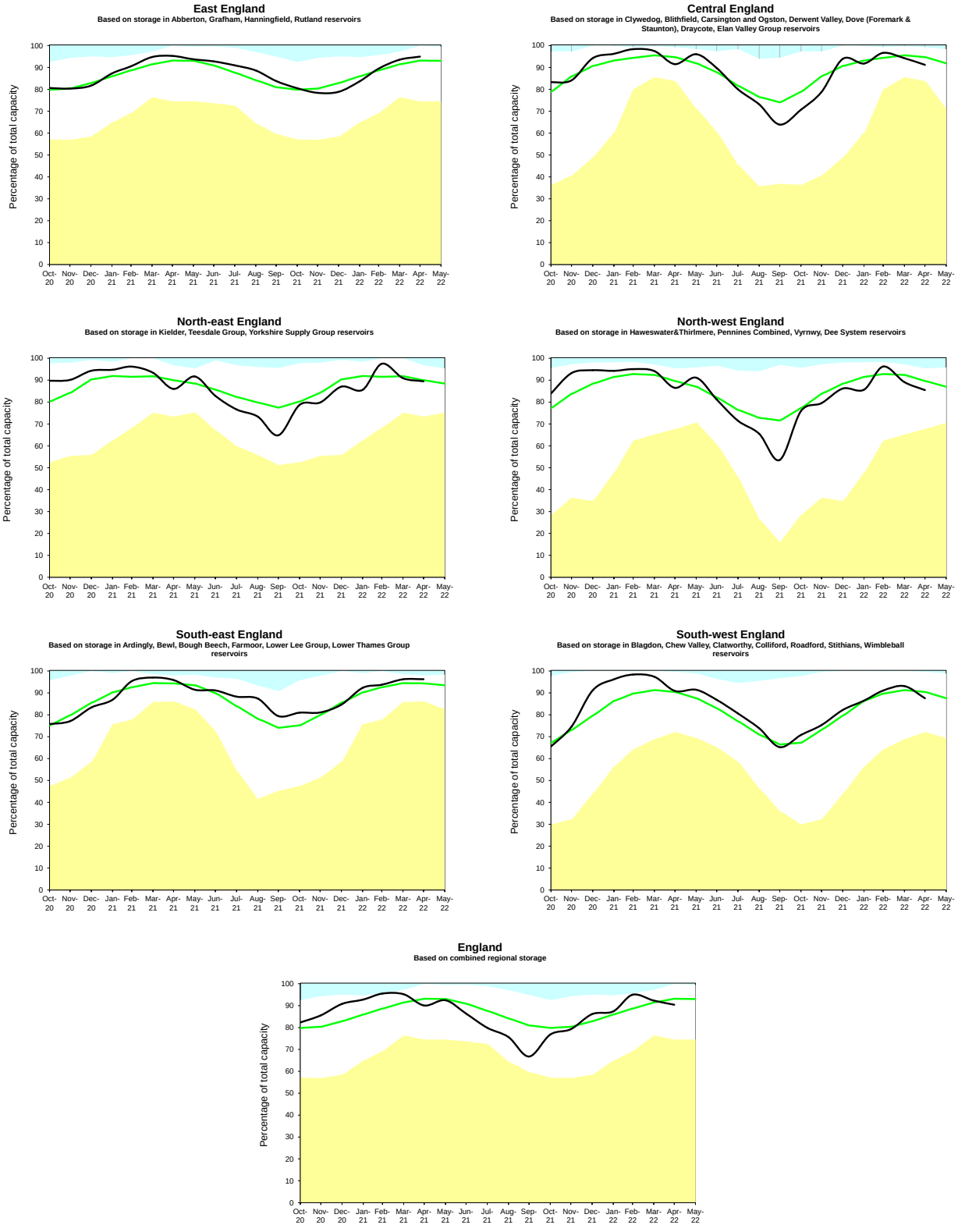
Reservoir storage



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 March 2022 and April 2022 as a percentage of total capacity and classed relative to an analysis of historic March and April 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



	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

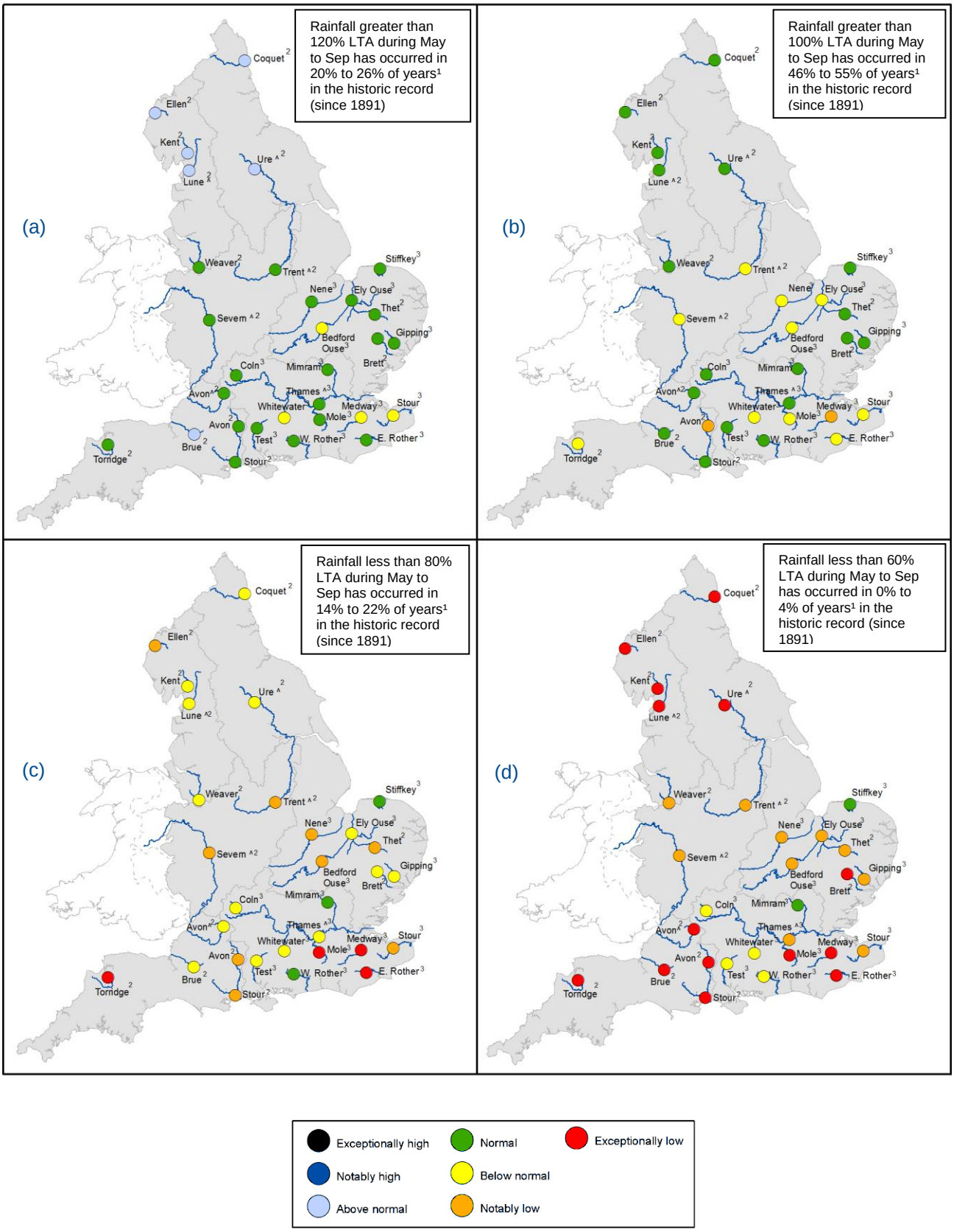
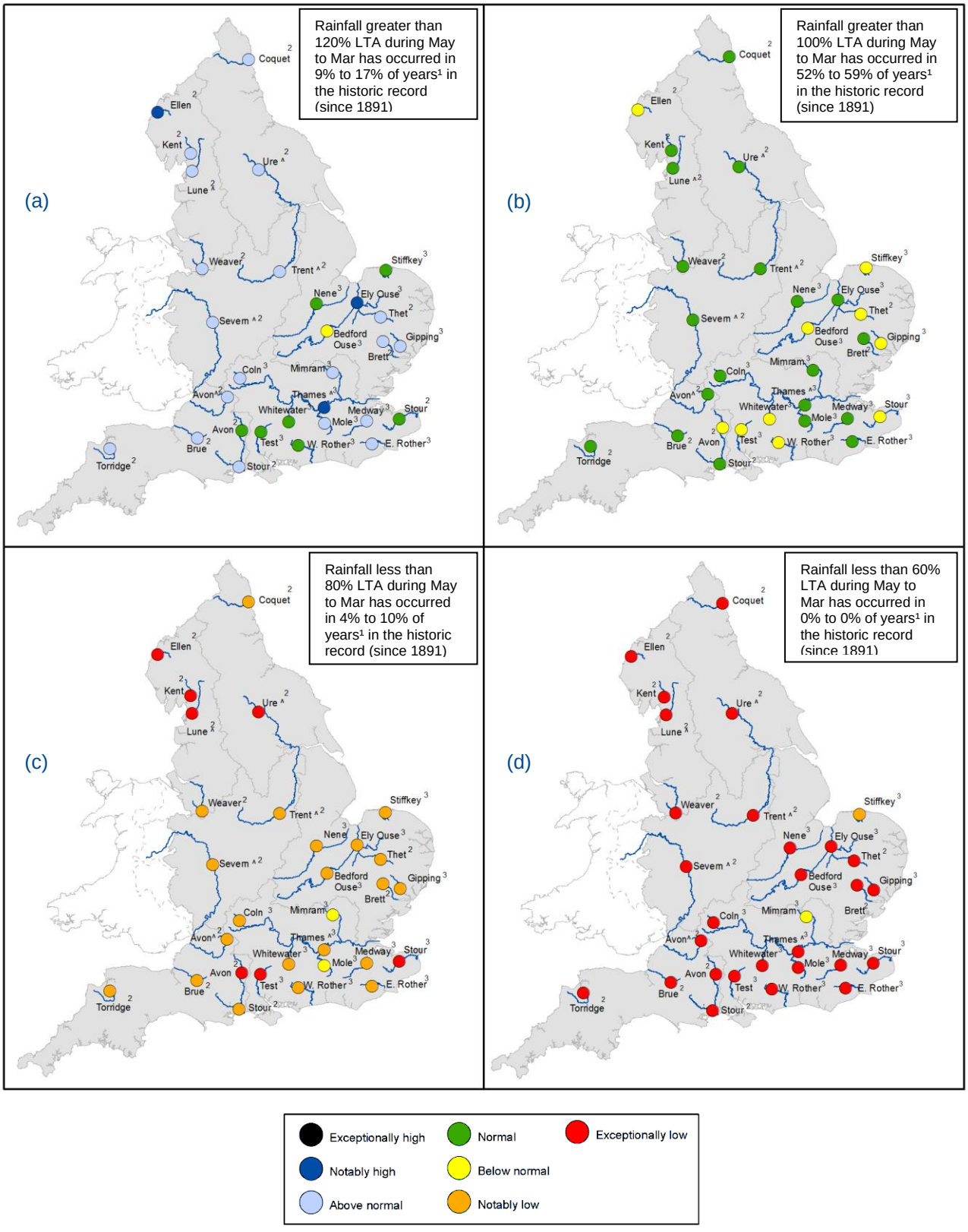


Figure 6.1: Projected river flows at key indicator sites up until the end of September 2022. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between May 2022 and September 2022 (Source: UK Centre for Ecology and Hydrology, Environment Agency)

[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*



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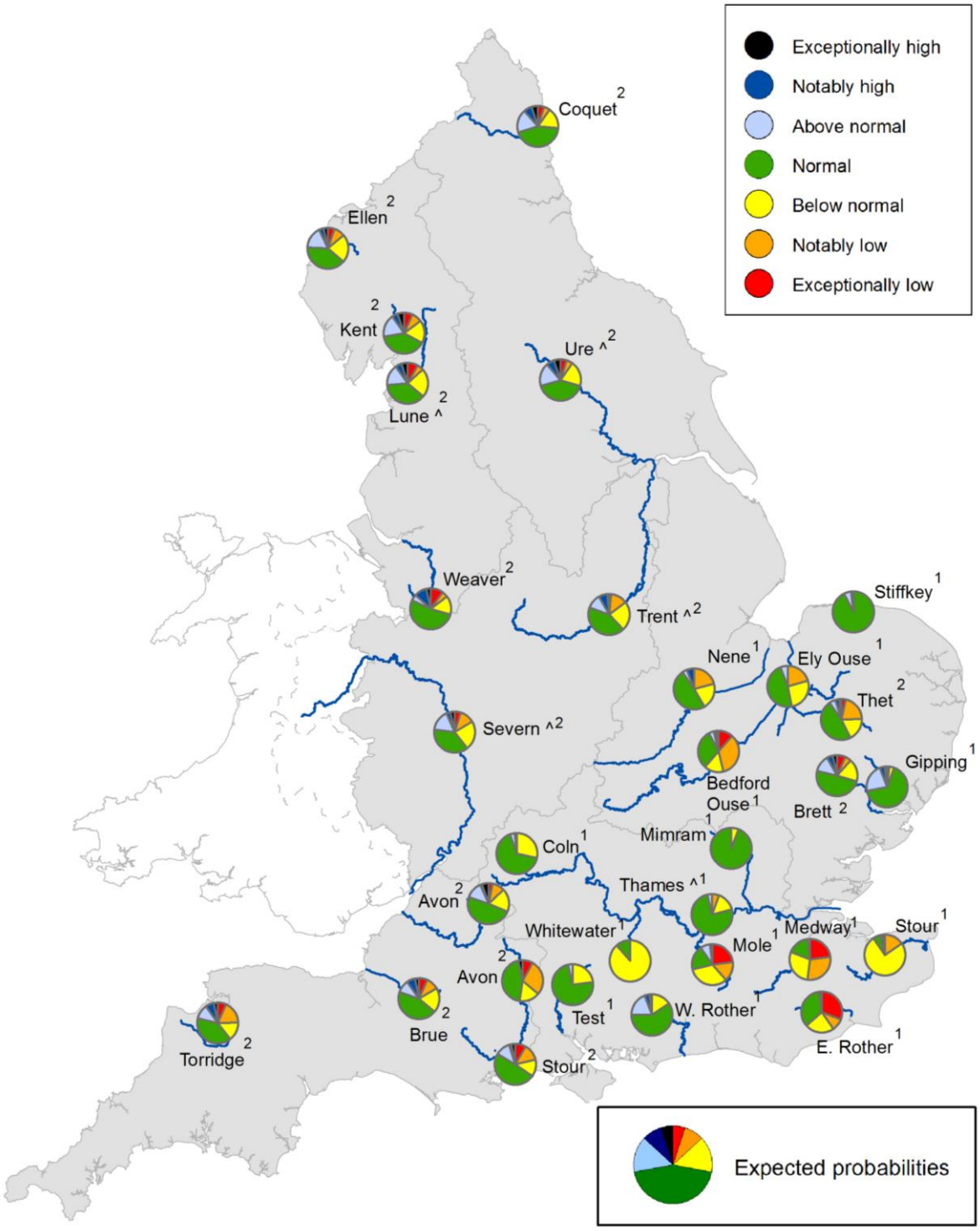

Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are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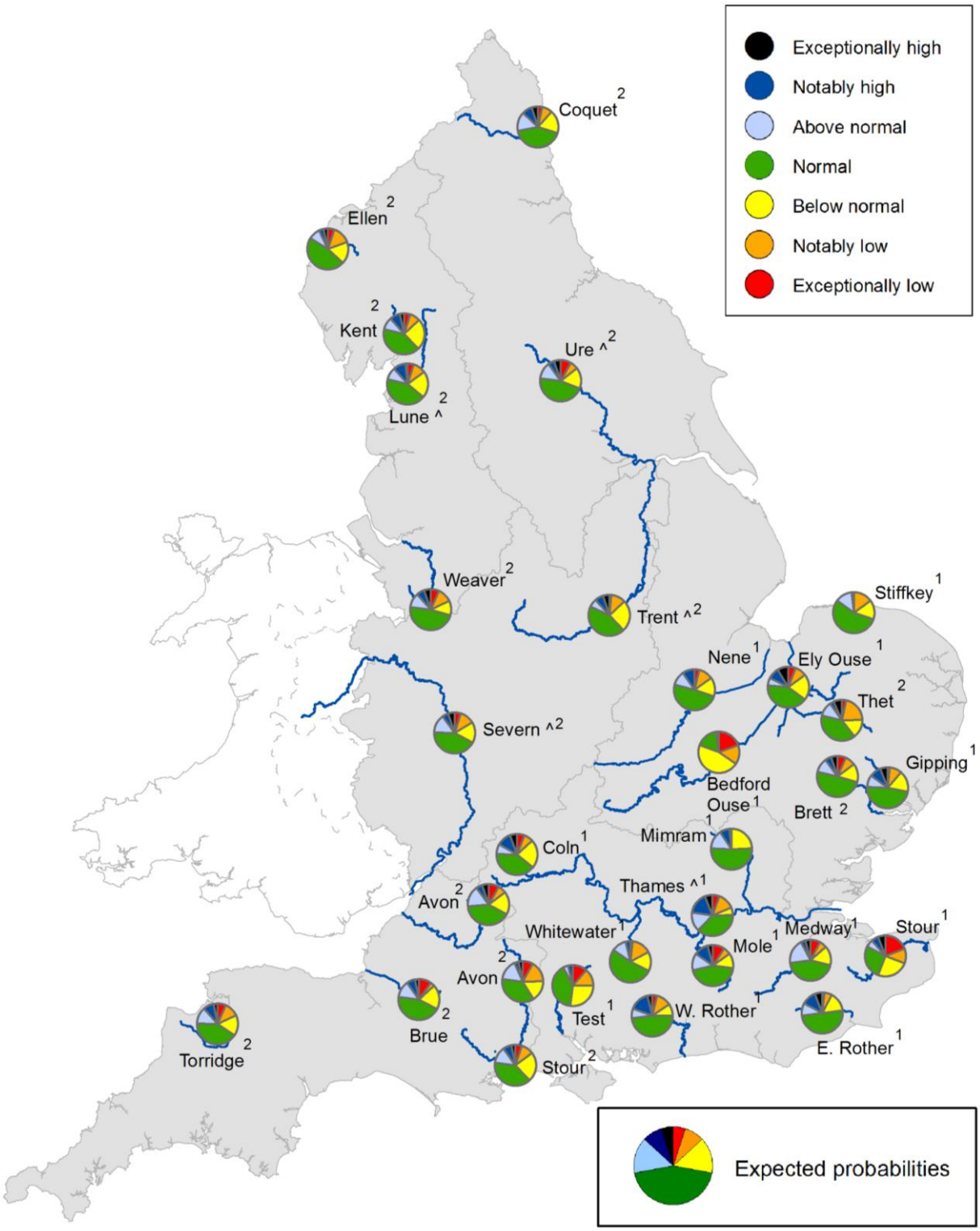

Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are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

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

Forward look: groundwater

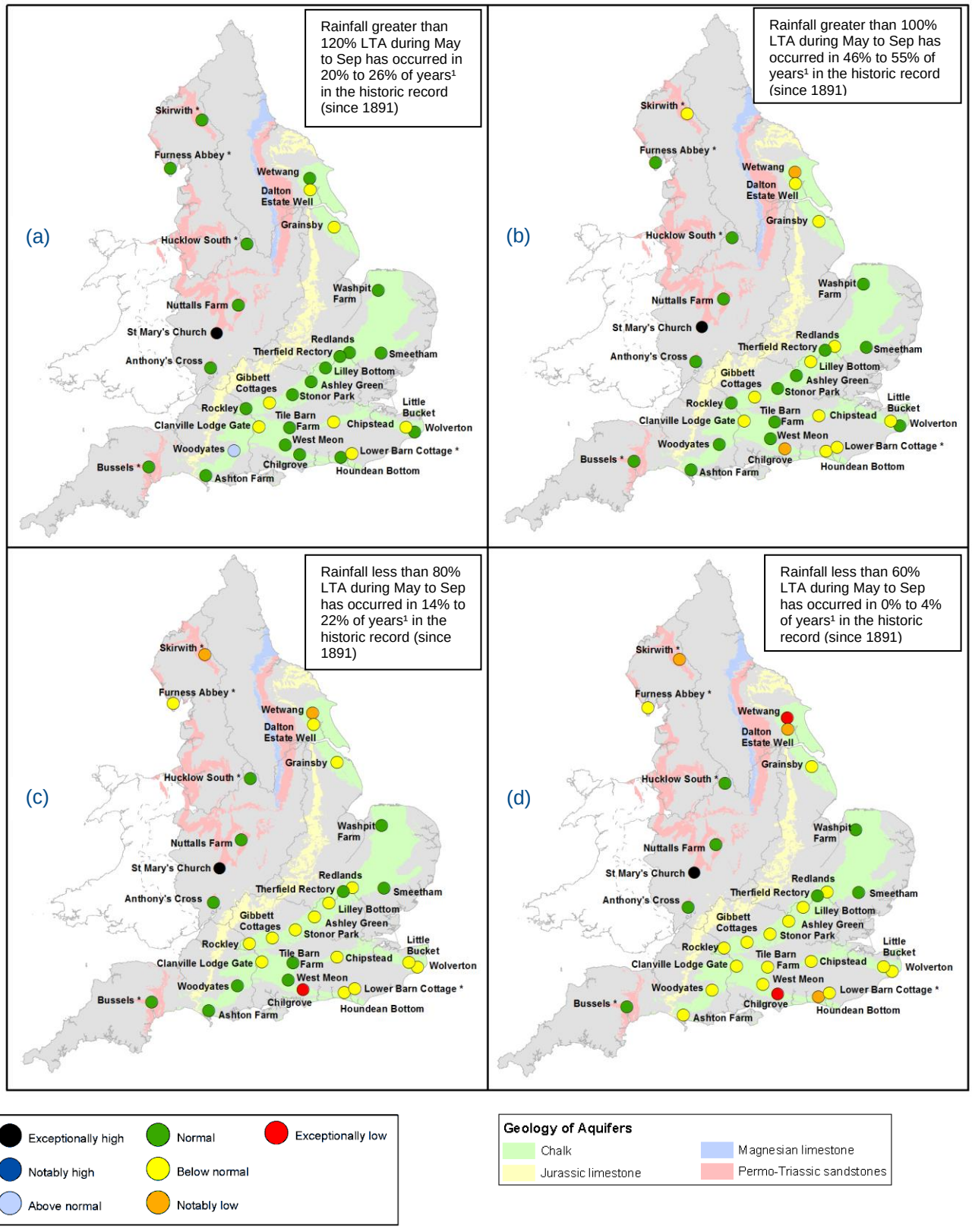

Figure 6.5: Projected groundwater levels at key indicator sites at the end of September 2022. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between May 2022 and September 2022 (Source: Environment Agency) Geological map reproduced with kind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

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

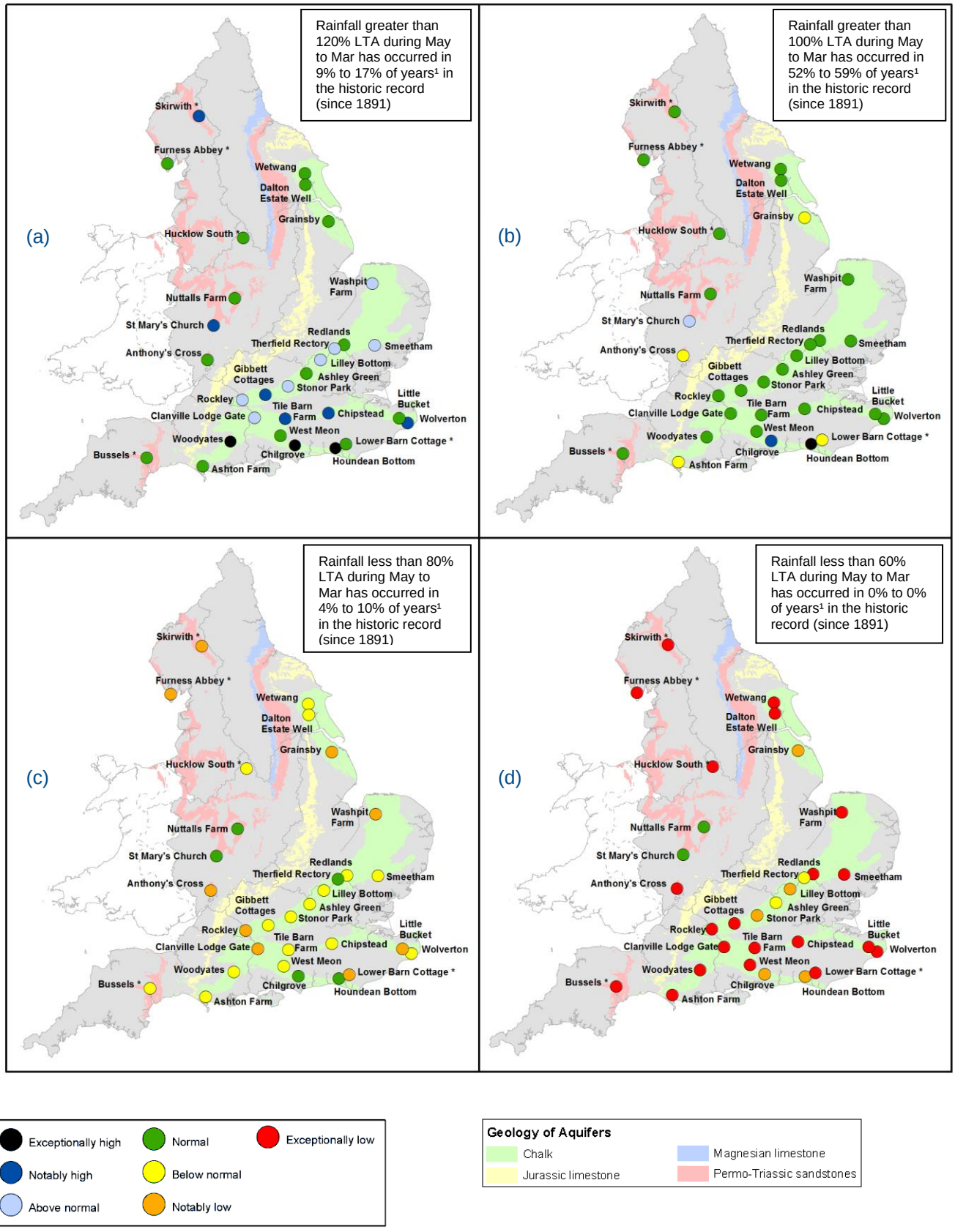

Figure 6.6: Projected groundwater levels at key indicator sites at the end of March 2023. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between May 2022 and March 2023 (Source: Environment Agency) Geological map reproduced with kind permission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

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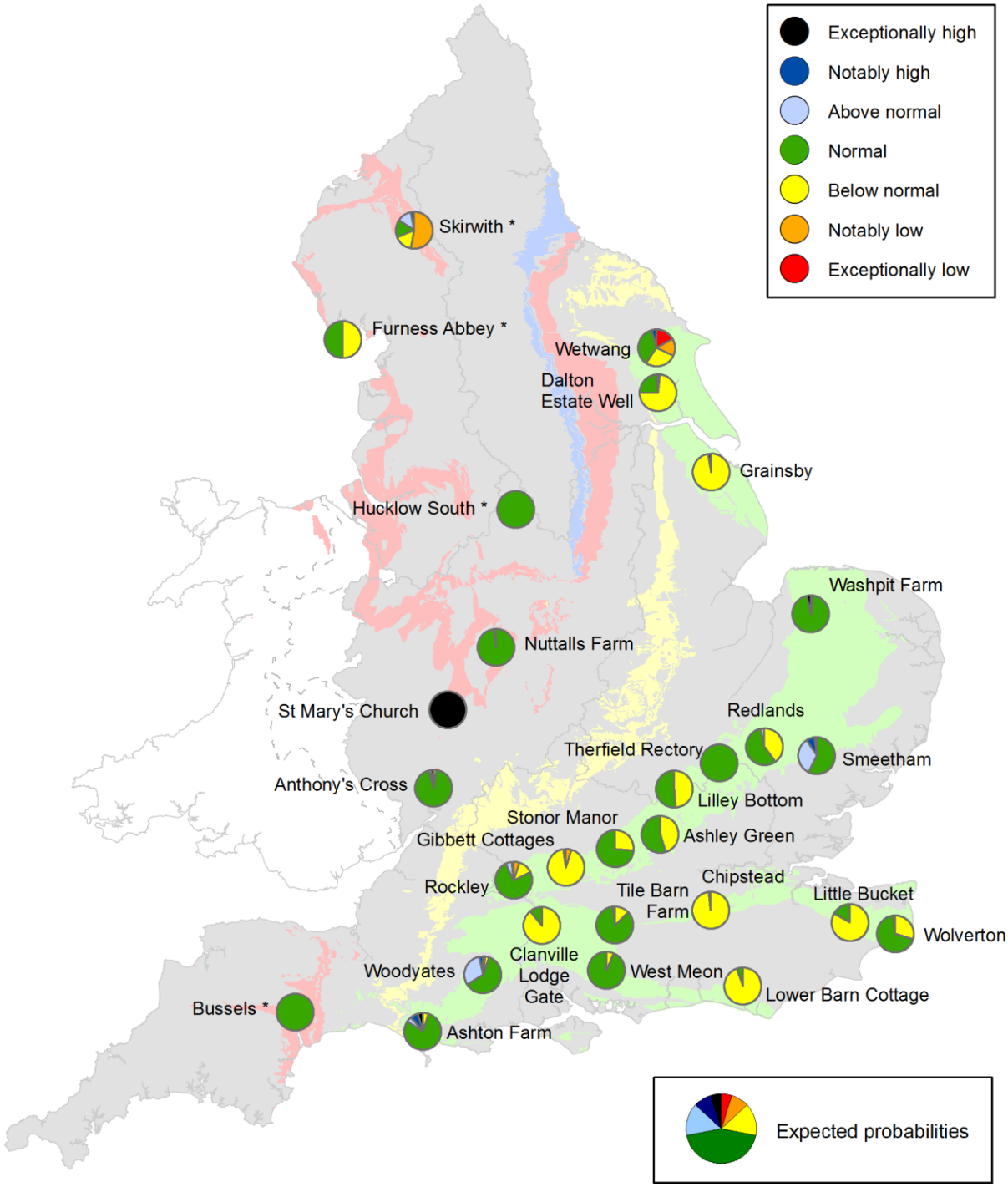
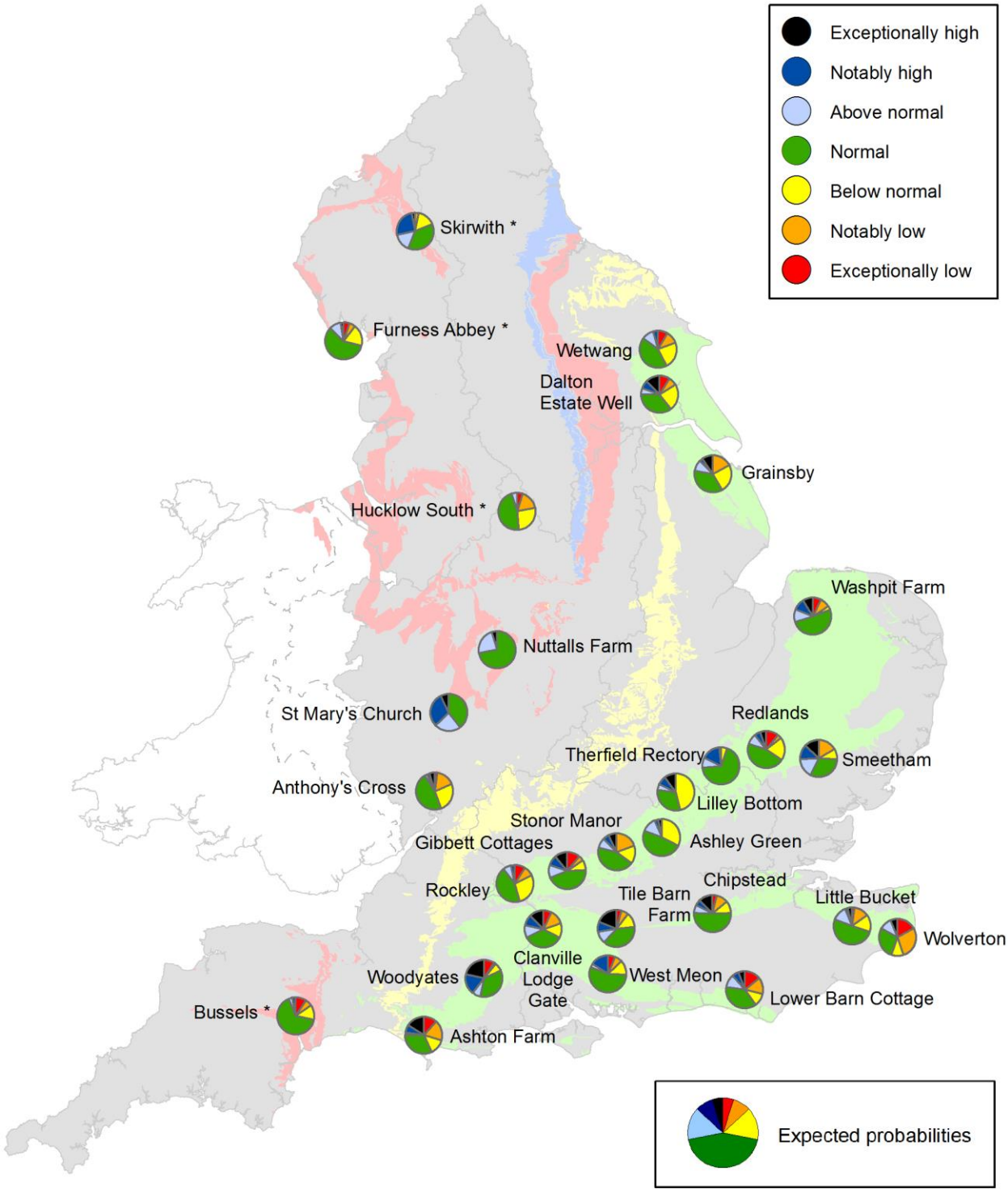


Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are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



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 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