Monthly water situation report

England

Summary – January 2022

Across England rainfall totals for January were significantly below average and were lower than normal for the time of year in all of the reported catchments. Soil moisture deficits were generally close to or larger than the long term average for the time of year. River flows decreased at most of the indicator sites reported on and the majority of sites were classed as below normal for the time of year. The end of January groundwater levels were classed as normal or higher for the time of year at most indicator sites. Reservoir stocks increased during January at the majority of the reservoirs and reservoir groups we report on.

Rainfall

The January rainfall total for England was 32mm which represents 40% of the 1961-1990 long term average (LTA) (38% of the 1991-2020 LTA). The lowest monthly totals were seen across south and central England (Figure 1.1).

Monthly rainfall totals were classed as lower than normal for the time of year in all catchments across England. Most of the catchments on the east coast were classed as exceptionally low, catchments in a band running from north-west England to the south coast were classed as notably low, while most catchments in south-west England were classed as below normal. In December the Tweed catchment (in the Scottish Borders) recorded the highest rainfall of all catchments as a proportion of the LTA; by contrast in January this same catchment recorded the lowest rainfall as a proportion of the LTA with only 15mm – equivalent to 22% of the LTA. Recorded rainfall in the Tweed catchment was the lowest on record for January (records go back to 1891); it was also the lowest rainfall on record in the Upper Welland and Nene catchment (near Peterborough in East Anglia). Over a third of the remaining catchments across England were within the top ten driest January's on record and over a half were within the top ten driest November to January 3 month periods on record (Figure 1.2).

The 3 month cumulative rainfall totals were classed as exceptionally low in the majority of catchments across southern England and the 12 month cumulative rainfall totals were classed as below normal across a quarter of all catchments, mainly in central England (Figure 1.2).

At a regional scale, January rainfall totals ranged from 32% of the LTA in east and south-east England to 60% of the LTA in north-west England. East England experienced the driest January since 1997 and the second driest on record (using records since 1891). Regional rainfall totals for January were exceptionally low for the time of year in north-east and east England, below normal in south-west England and notably low over the rest of England. South-east England had the driest November to January since 1989 and the fourth driest on record (using records since 1891) (Figure 1.3).

Soil moisture deficit

During January soil moisture deficits (SMD) increased slightly everywhere except across north-west England where there were the largest rainfall totals (Figure 2.1). End of January SMD values across the country were generally close to or larger than the LTA for the time of year (soils were slightly drier than average). At a regional scale, the end of January SMDs for all regions were larger than average (soils were drier than average) for the time of year – east England had the driest soils (Figure 2.2

River flows

January monthly mean river flows decreased at three-quarters of the indicator sites we report on compared to December. Flows at two-thirds of sites across England were classed as below normal for the time of year. Just two sites in northern England were classed as notably low while all remaining sites were classed as normal (Figure 3.1).

At the regional index sites monthly mean flows were classed as normal for the time of year only in north-west England. Nearly all remaining regional index sites were classed as below normal with the exception of the Tyne at Haydon bridge in north-east England which was classed as notably low (Figure 3.2).

Groundwater levels

Groundwater levels increased at over two-thirds of the reported indicator sites during January. End of month levels were classed as normal for the time of year at three-quarters of the indicator sites reported on. Jackaments Bottom in the Jurassic limestone was classed as notably low for the time of year which was a change in class from below normal at the end of December. Tilshead in the Upper Hampshire Avon Chalk was classed as below normal for the time of year which was a change in class from normal at the end of December. At all remaining indicator sites groundwater levels remained in the same class as at the end of December (Figures 4.1).

January groundwater levels at the major aquifer index sites ranged from being classed as notably high at Weir Farm in the Bridgenorth Sandstone to notably low in the Jurassic limestone at Jackaments Bottom. The chalk index sites at Little Bucket, Stonor Park, Chilgrove, Dalton Holme and Redlands Hall were classed as normal (Figure 4.2).

Reservoir storage

End of January reservoir stocks increased at three-quarters of the reservoirs and reservoir groups we report on. The largest increases of 10% of total capacity were recorded at the Lower Thames reservoir group in south-east England and at Stithians reservoir in south-west England. The largest decreases of 8% of total capacity were recorded at the Derwent Valley in central England and at Vyrnwy which supplies north-west England (Figure 5.1).

End of month reservoir stocks were classed as normal or higher for the time of year at two-thirds of reported reservoir sites. Nine reservoirs or reservoir groups were classed as below normal for the time of year, and two were notably low (Figure 5.1).

At a regional scale, total reservoir stocks ranged from 84% in east England to 92% in south-east and central England. Total reservoir stocks for England were at 87% of total capacity at the end of January (Figure 5.2).

Forward look

Unsettled conditions are expected throughout February, with the wettest weather in the west and north west. Temperatures are expected to be average or mild for much of the country. Later in the month low pressure systems are could bring further storms across the north with strong winds and heavy rain. In the south conditions are expected to be more settled with drier and milder weather.

From February to April the 3 month period is more likely to be mild than usual, with slightly higher than normal chances of the period being wet. Winds from the west and southwest will be more dominant than expected, bringing wet, windy and mild conditions.

Projections for river flows at key sites[1]

By the end of March and September 2022, all the modelled sites have a greater than expected chance of cumulative river flows being normal or lower for the time of year.

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

Projections for groundwater levels in key aquifers[2]

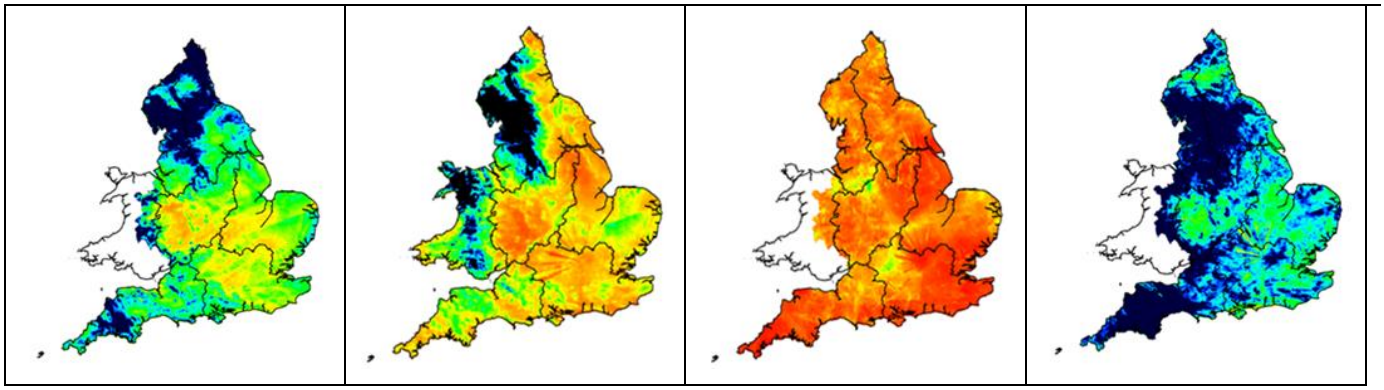
By the end of March 2022, around half of the modelled sites have a greater than expected chance of normal or lower groundwater levels for the time of year. By the end of September 2022, less than a fifth of modelled sites have a greater than expected chance of above normal or higher groundwater levels for the time of year.

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

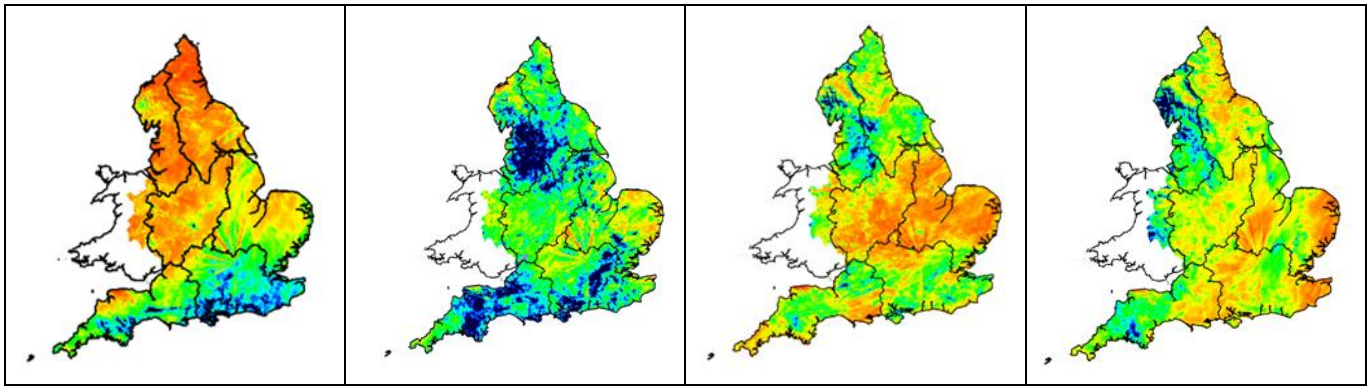
Authors: National Water Resources Hydrology Team

[1] 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.

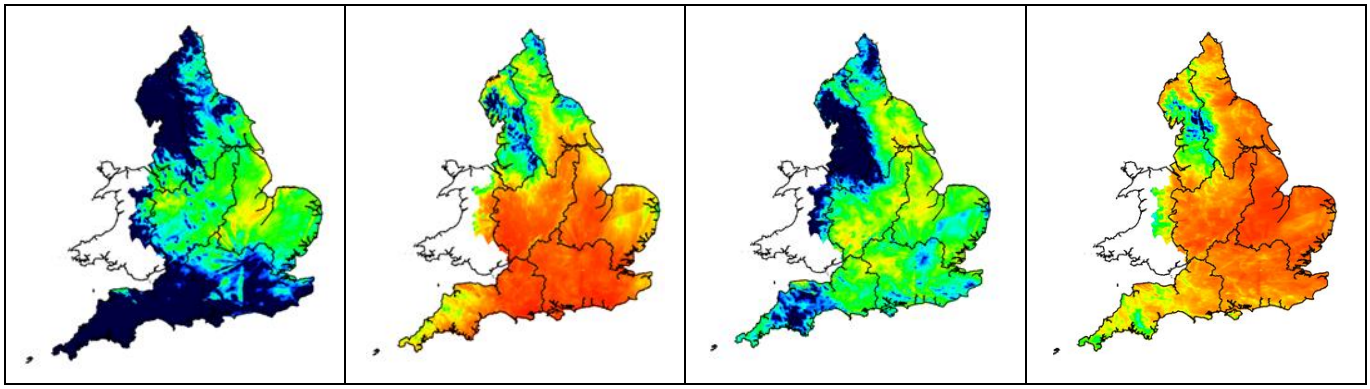
Rainfall



February 2021 | March 2021 | April 2021 | May 2021

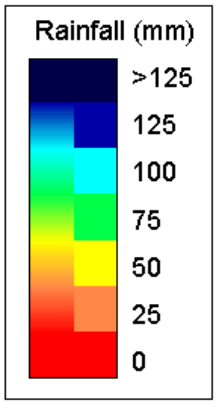


June 2021 | July 2021 | August 2021 | September 2021



October 2021 | November 2021 | December 2021 | January 2022

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



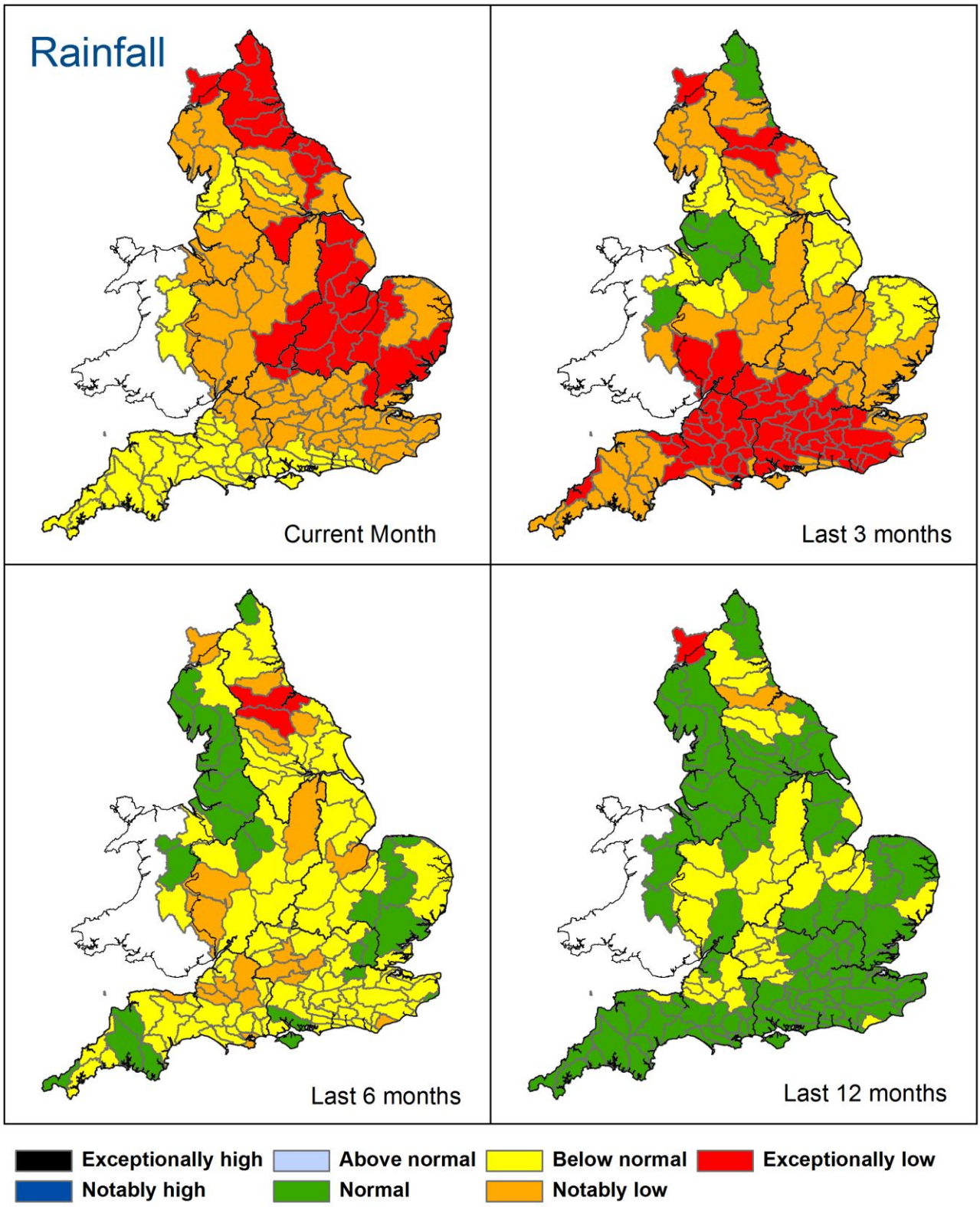


Figure 1.2: Total rainfall for hydrological areas across England for the current month (up to 31 January), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. HadUK data based on the Met Office 1km gridded rainfall dataset derived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

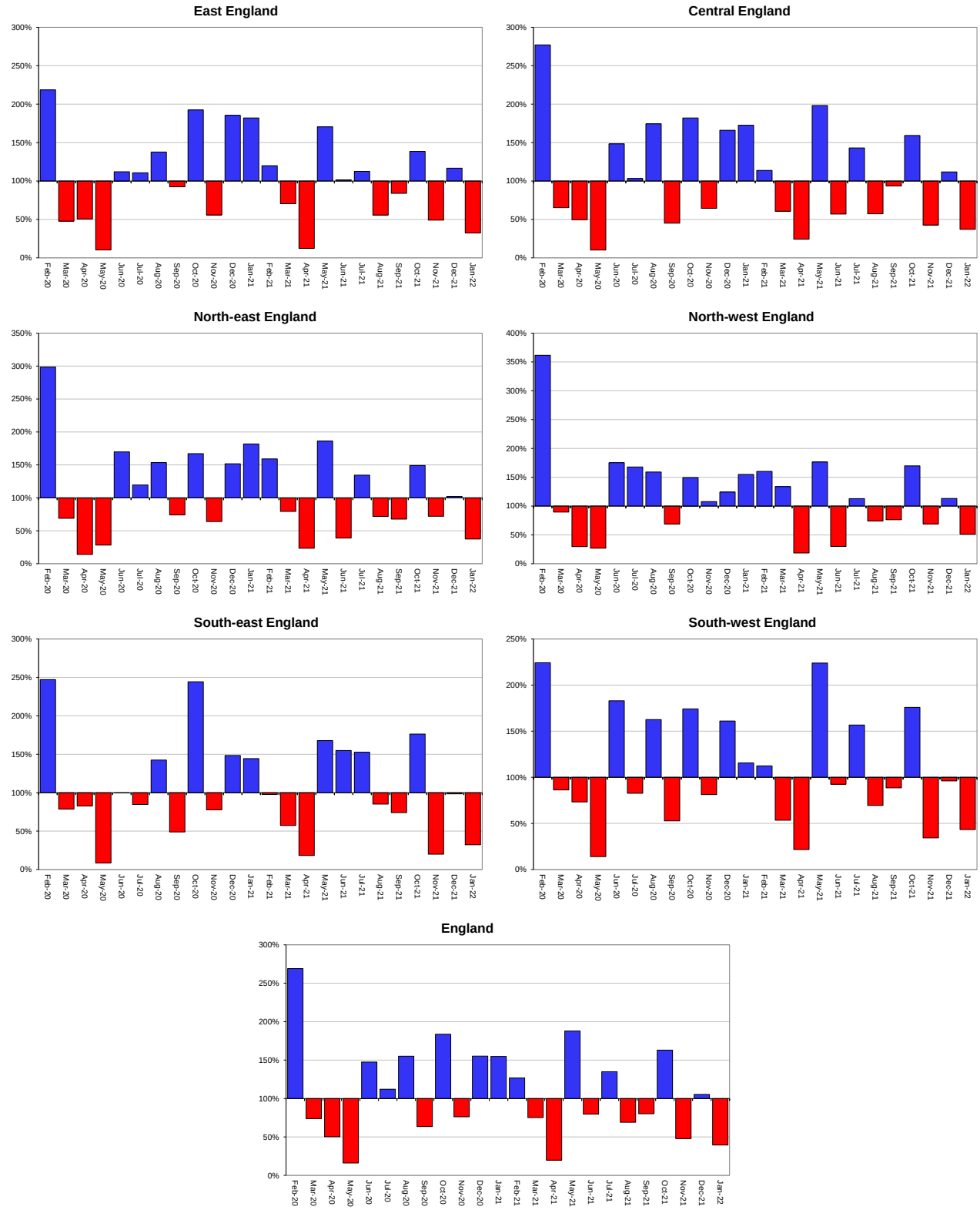


Figure 1.3: Monthly rainfall totals for the past 24 months as a percentage of the 1961 to 1990 long term average for each region and for England. HadUK rainfall data. (Source: Met Office © Crown Copyright, 2022
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Soil moisture deficit

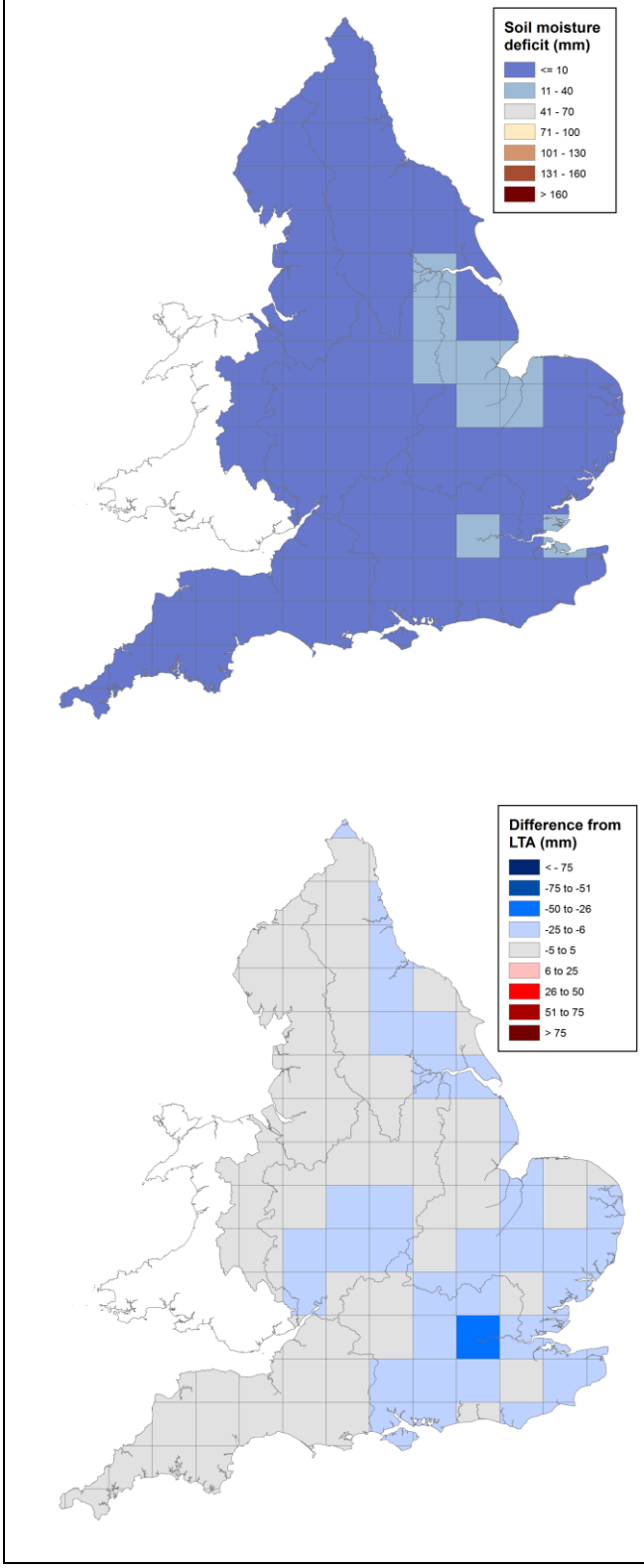
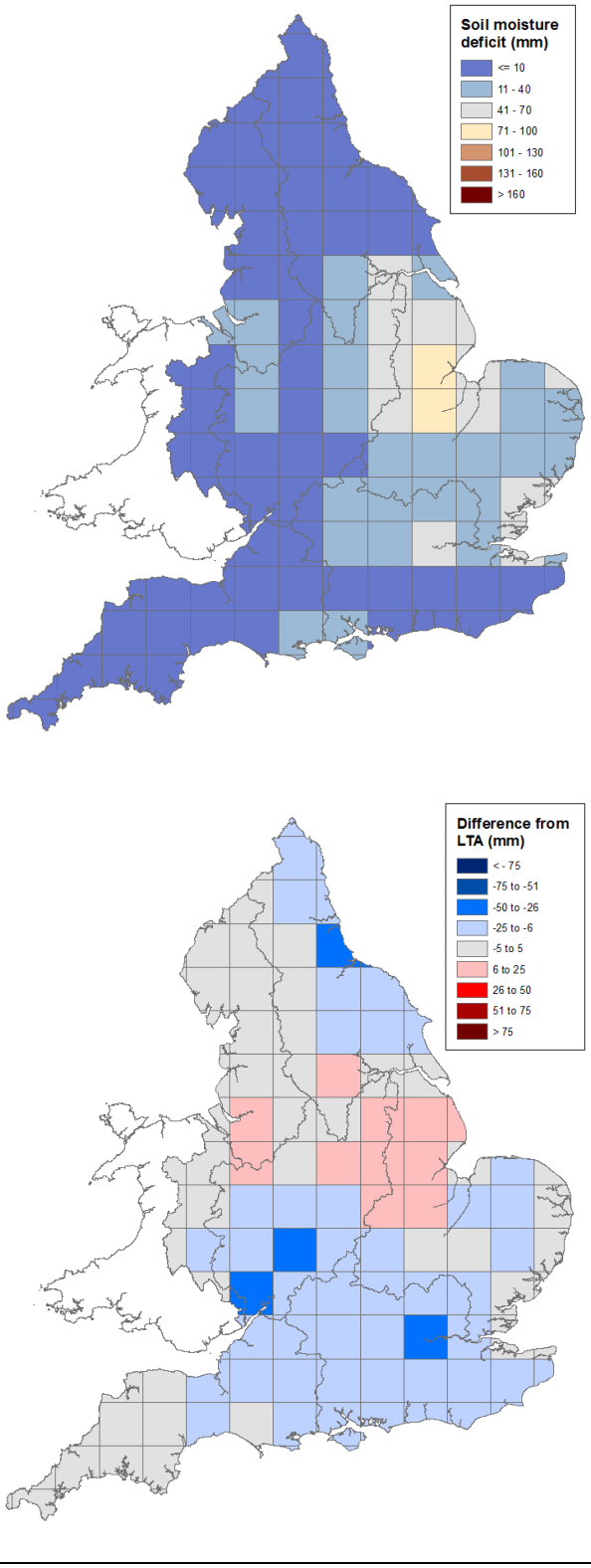
End of December 2021[1]	End of January 2022[2]
	

Figure 2.1: Soil moisture deficits for weeks ending 04 January 2022 [1] (left panel) and 01 February 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

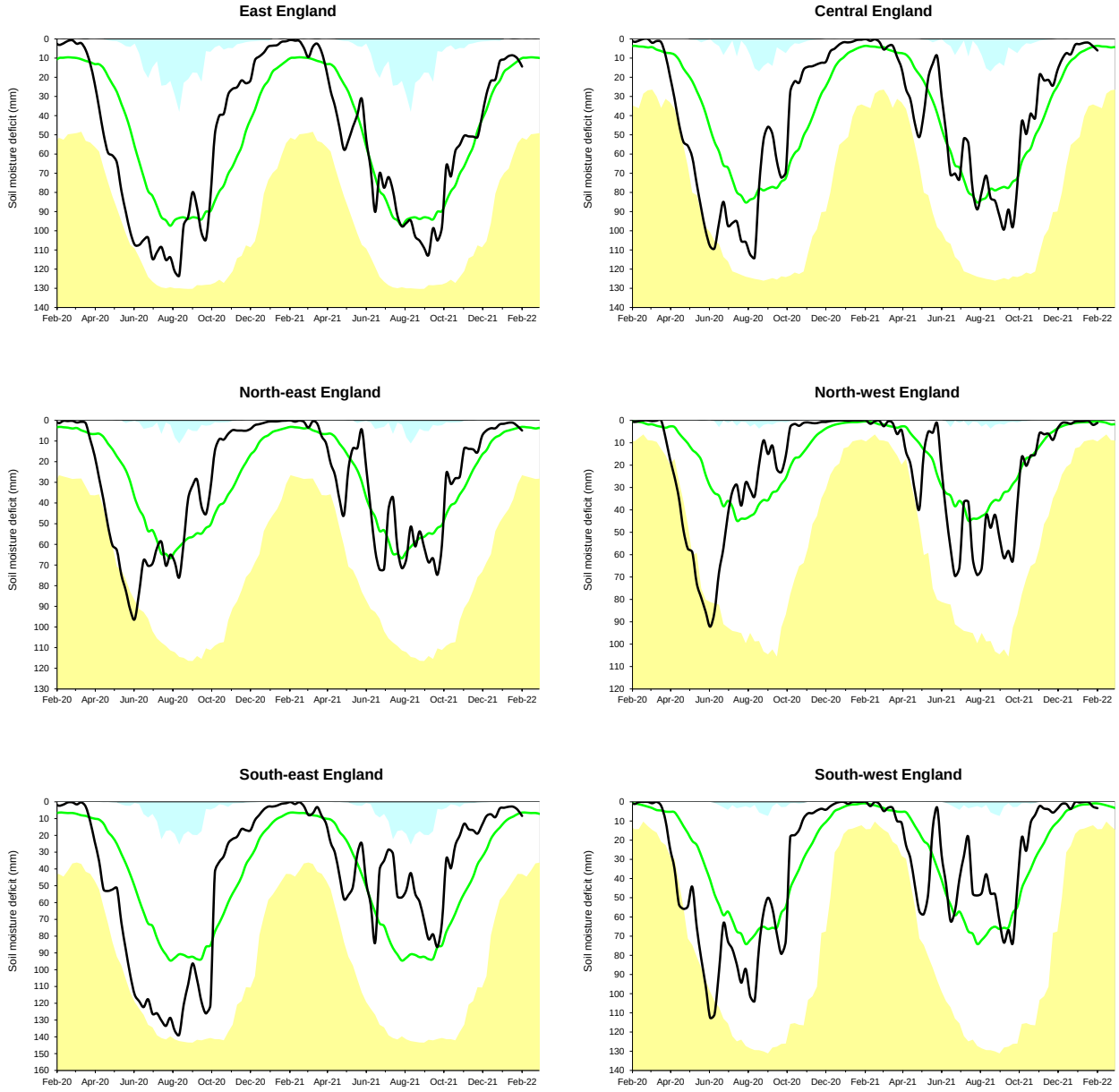
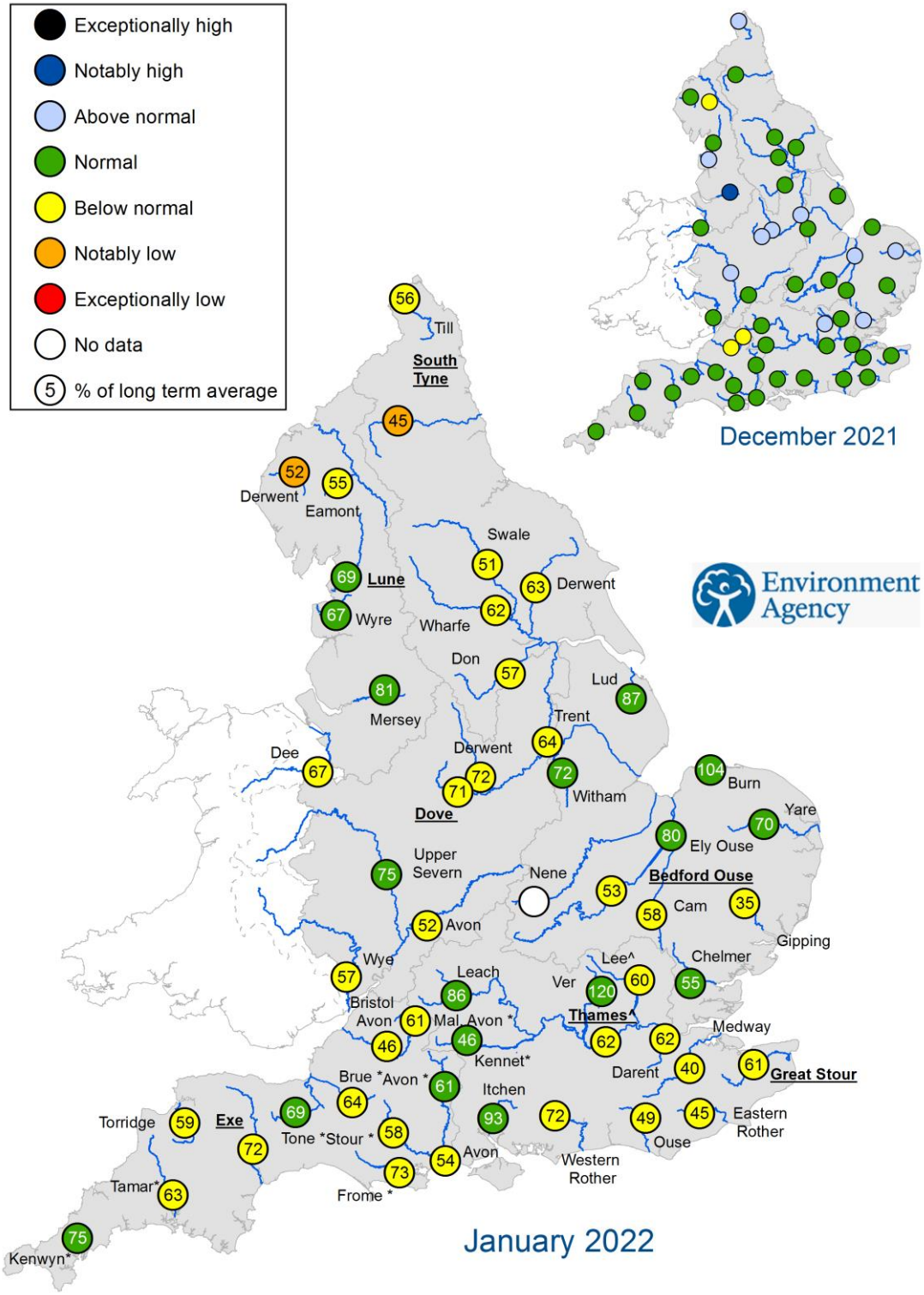


Figure 2.2: Latest soil moisture deficits for all geographic regions compared to maximum, minimum and 1961 to 90 long term average. Weekly MORECS data for real land use. (Source: Met Office © Crown Copyright, 2022).

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 December 2021 and January 2022, 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). Crown copyright. All rights reserved. Environment Agency, 100024198, 2022.

River flow charts

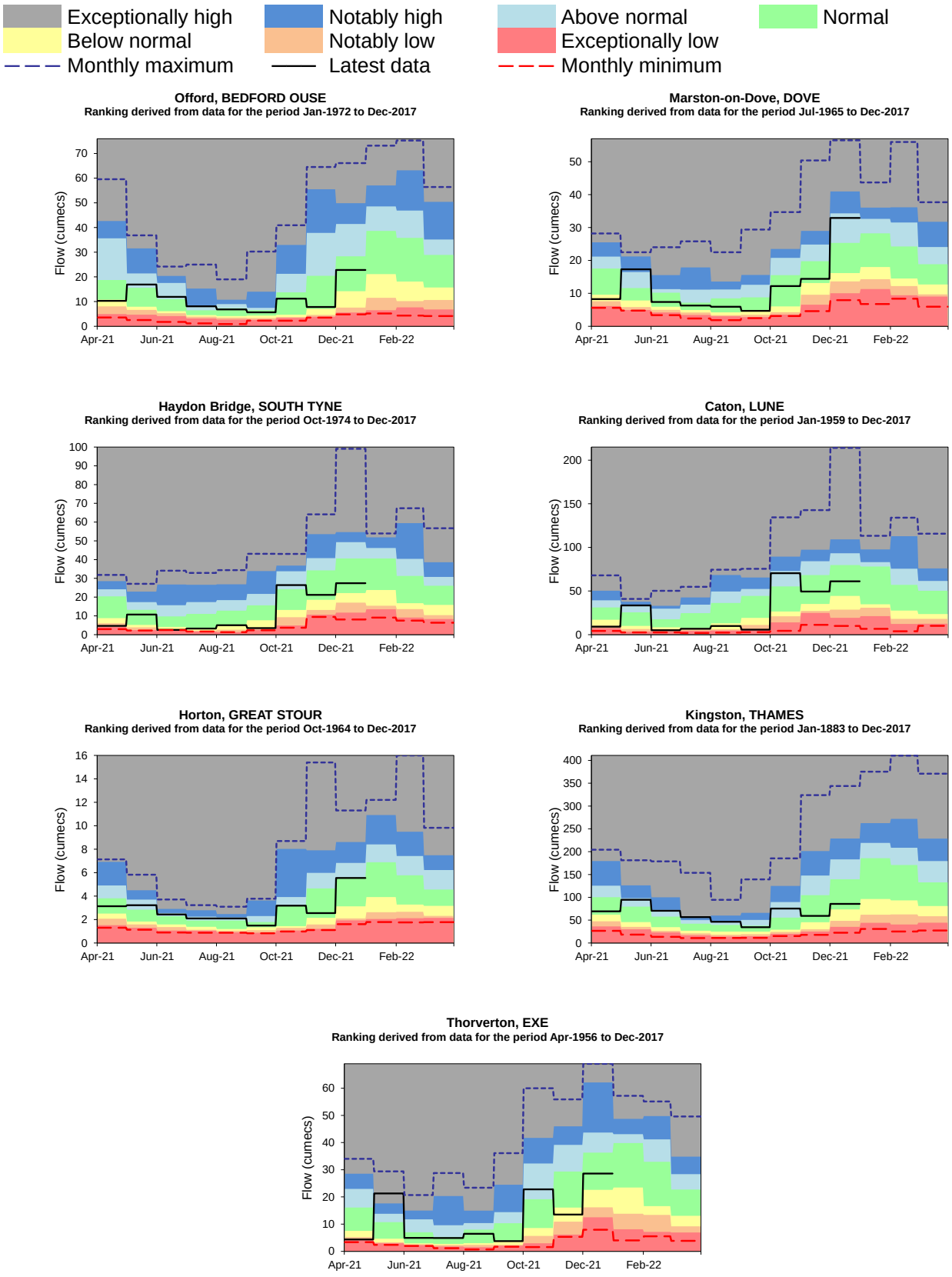
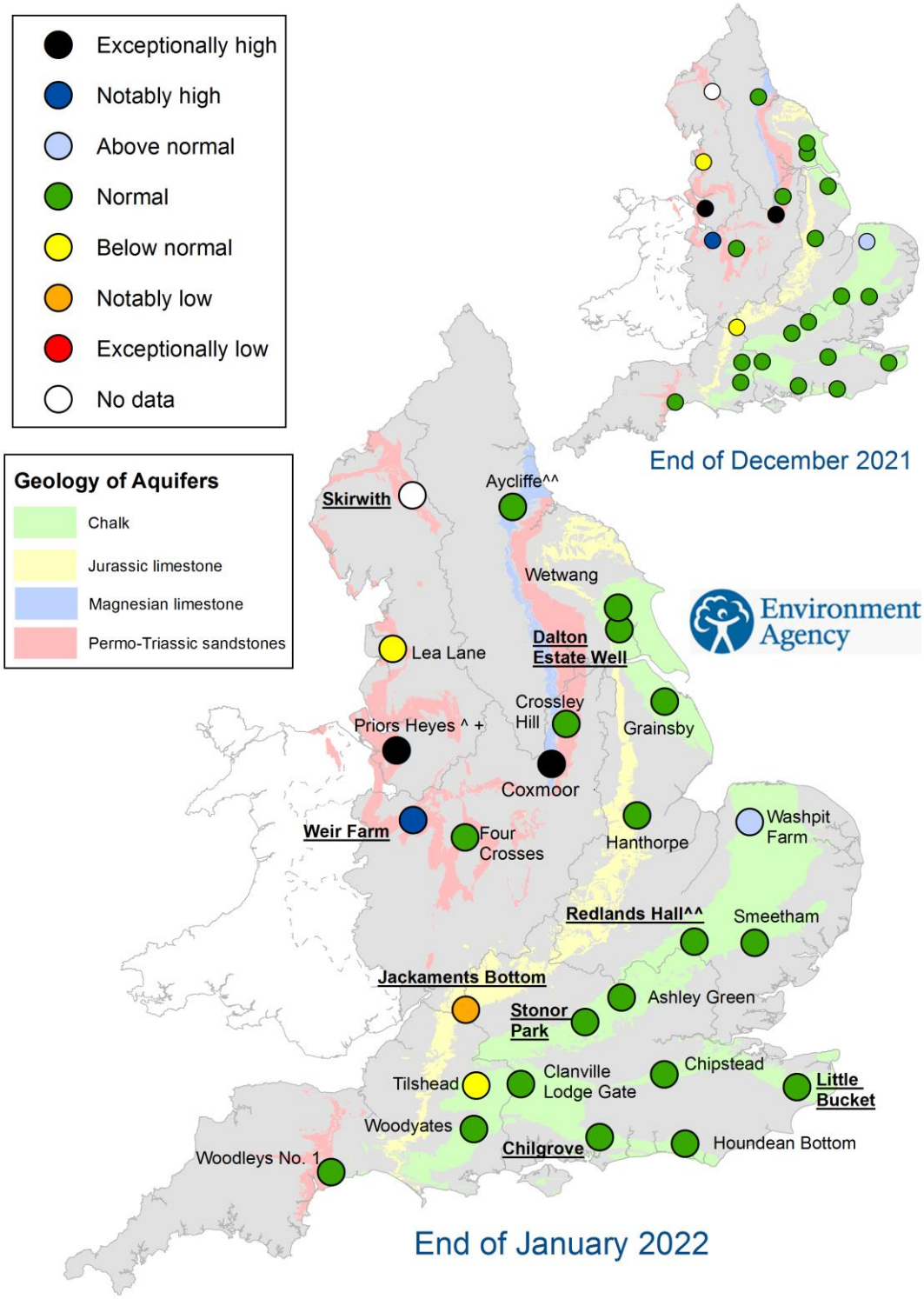


Figure 3.2: Index river flow sites for each geographic region. Monthly mean flow compared to an analysis of historic monthly mean flows, long term maximum and minimum flows. (Source: Environment Agency, 2022).

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 December 2021 and January 2022, classed relative to an analysis of respective historic December and January levels (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2022.

Groundwater level charts

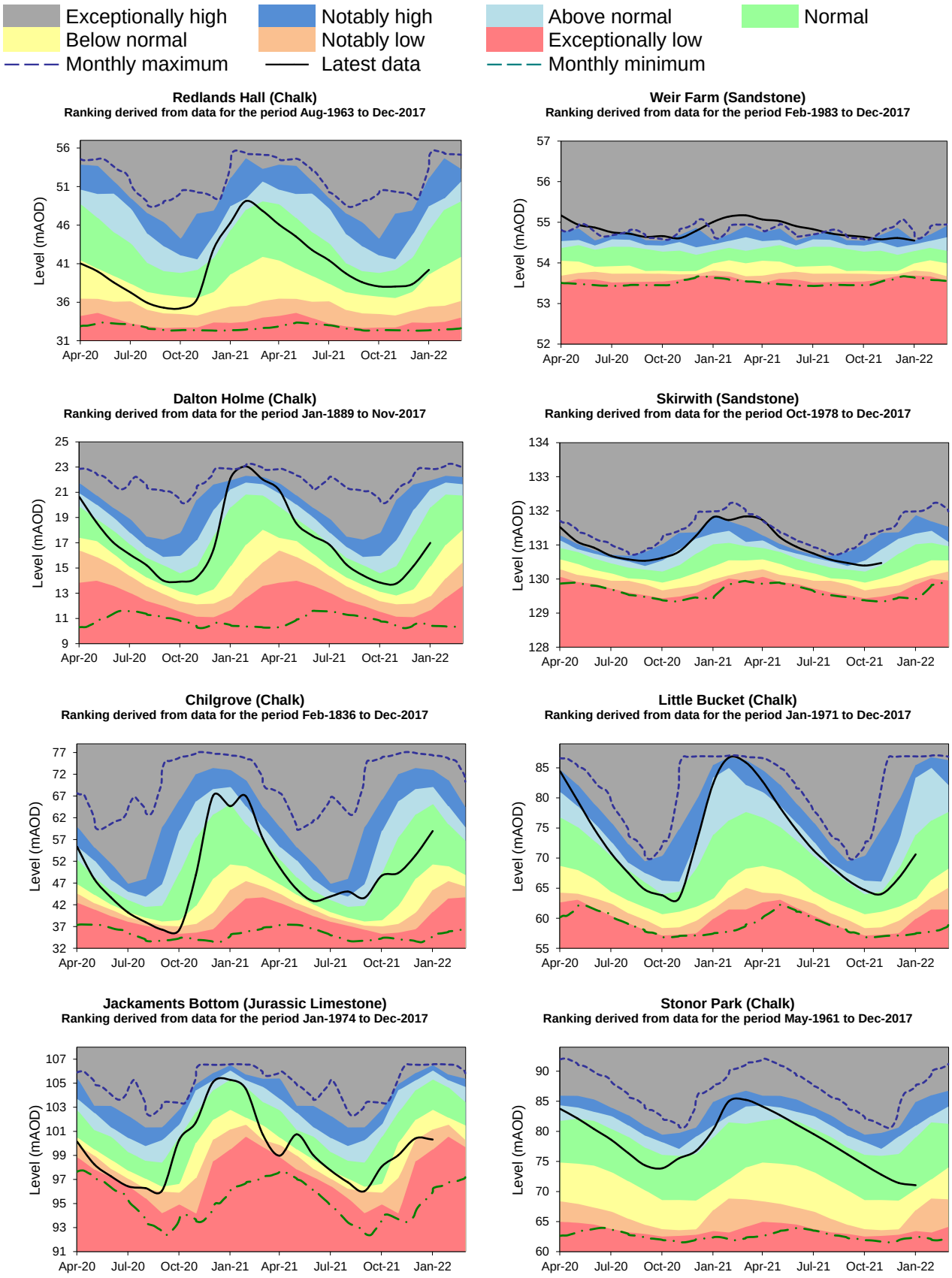
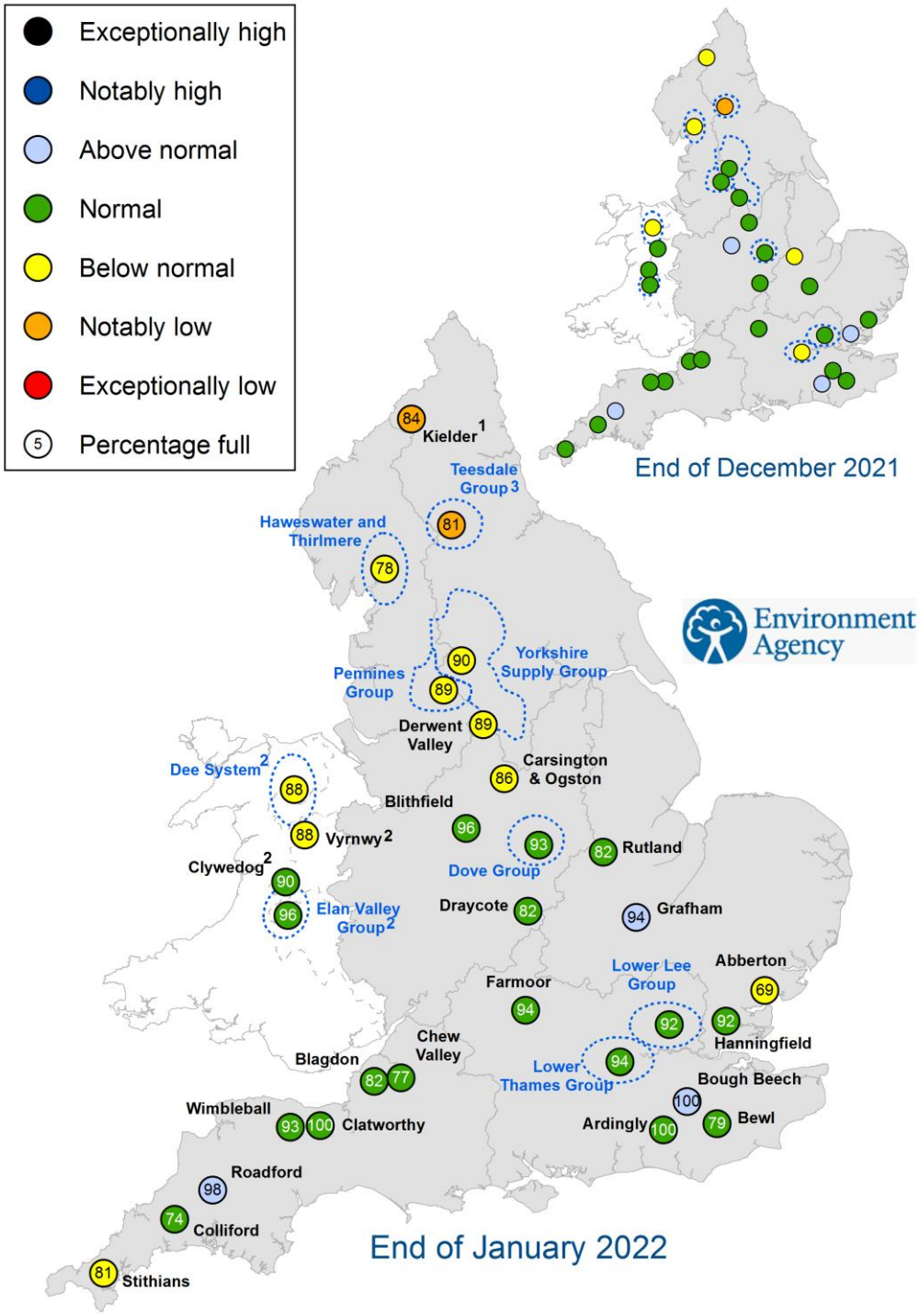


Figure 4.2: Index groundwater level sites for major aquifers. End of month groundwater levels months compared to an analysis of historic end of month levels and long term maximum and minimum levels. (Source: Environment Agency, 2022).

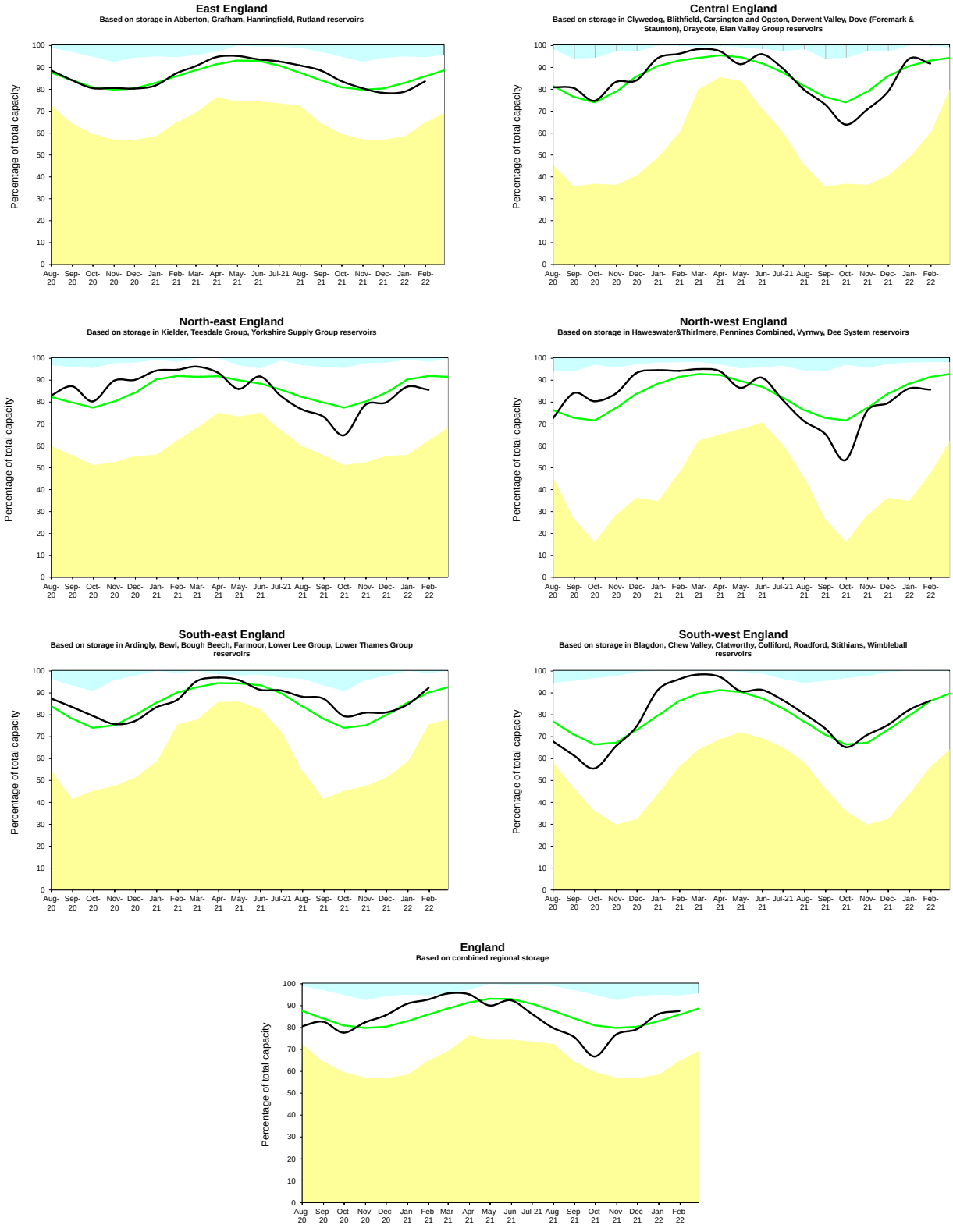
Reservoir storage



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 December 2021 and January2022 as a percentage of total capacity and classed relative to an analysis of historic January and February 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

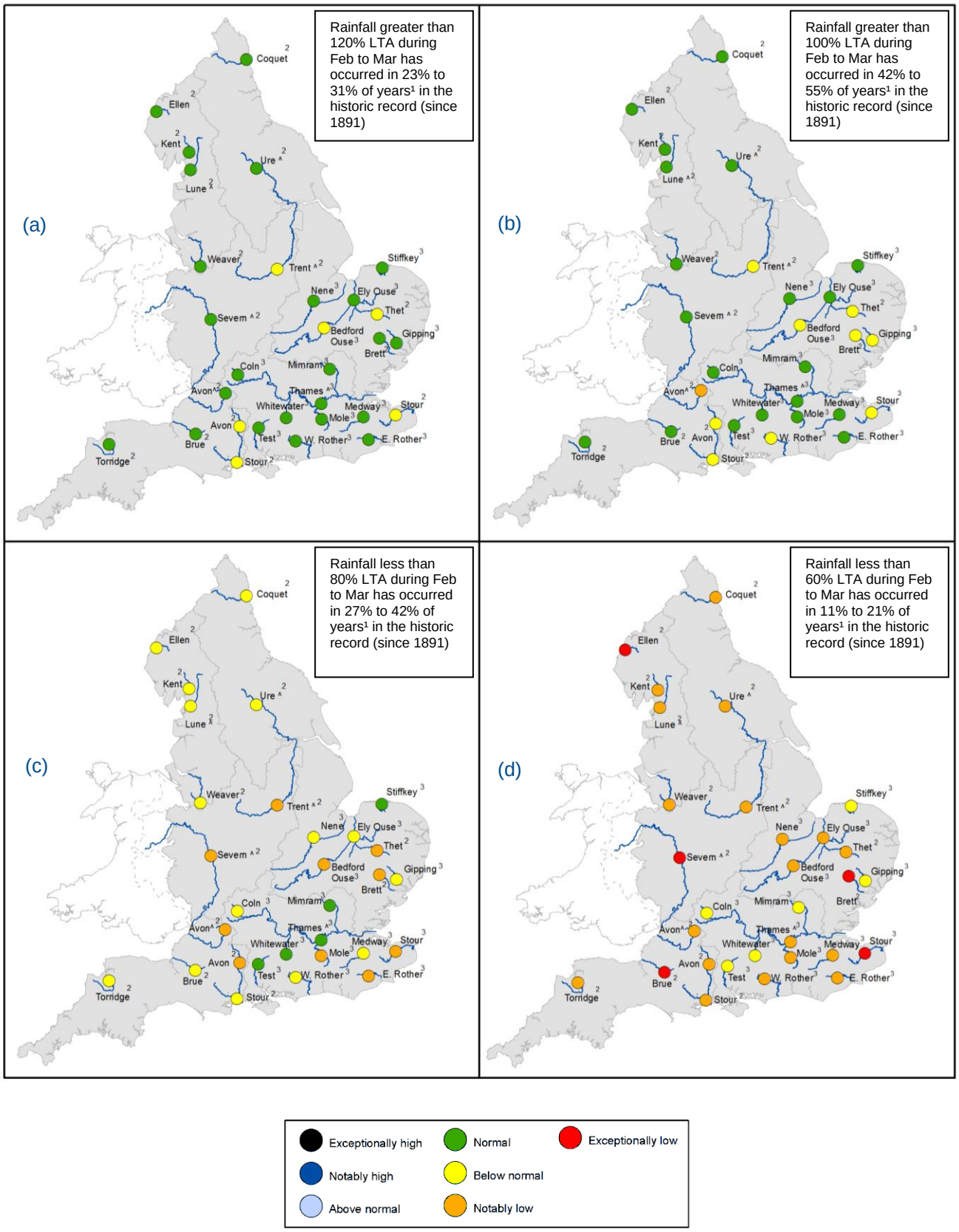
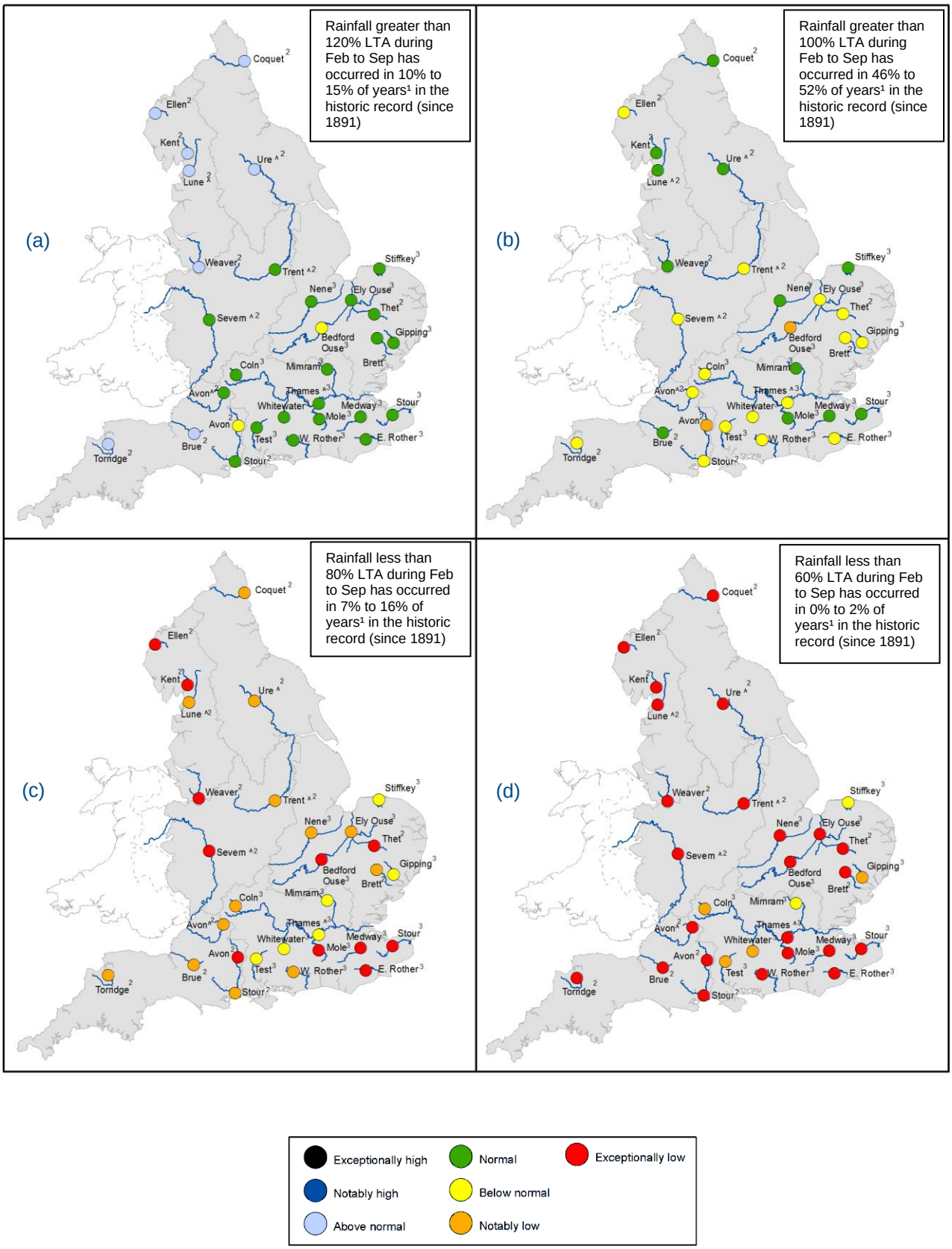


Figure 6.1: Projected river flows at key indicator sites up until the end of March 2022, Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February 2022 and March 2022 (Source: UK Centre for Ecology and Hydrology, Environment Agency)

[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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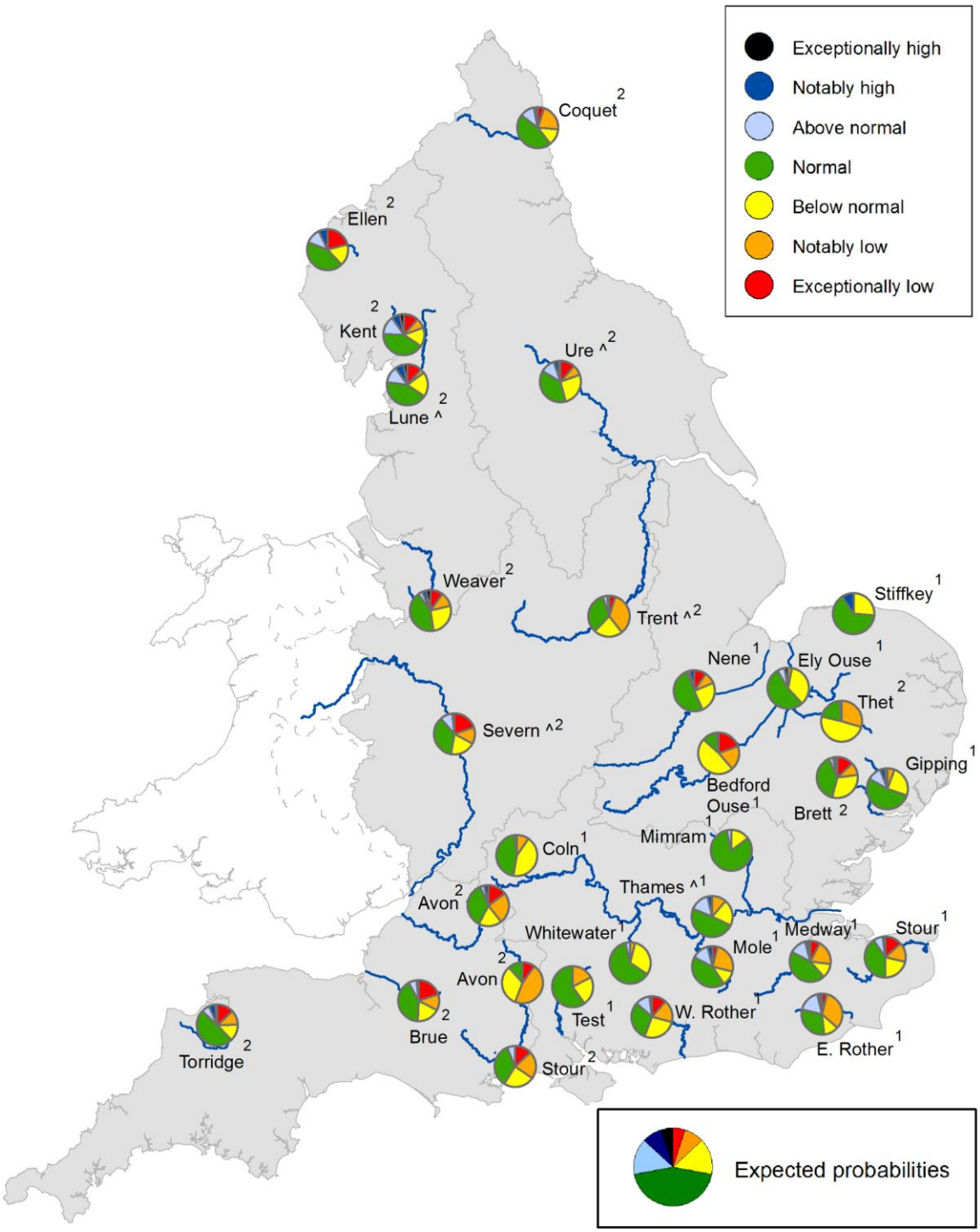

Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are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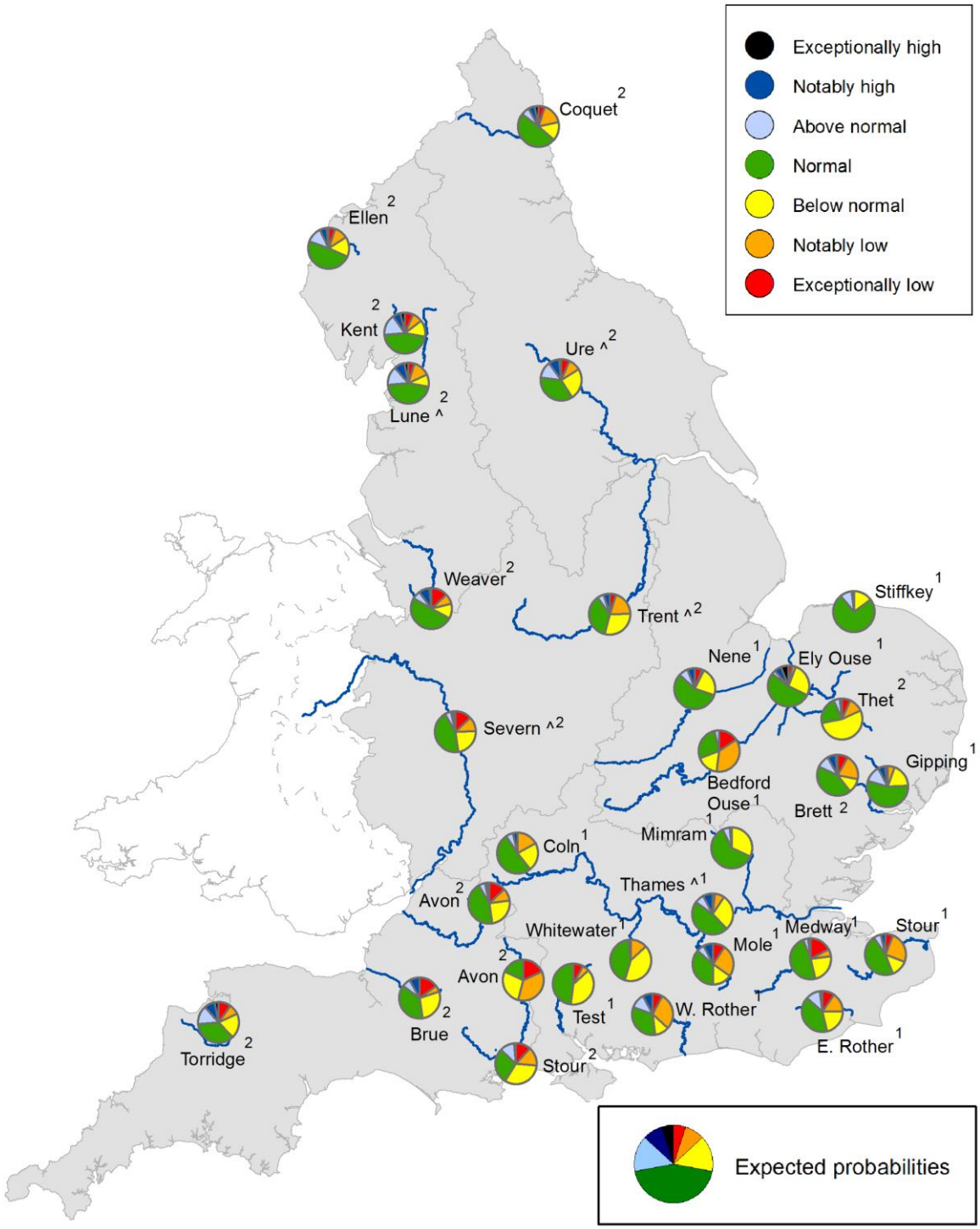


Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are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

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

Forward look: groundwater

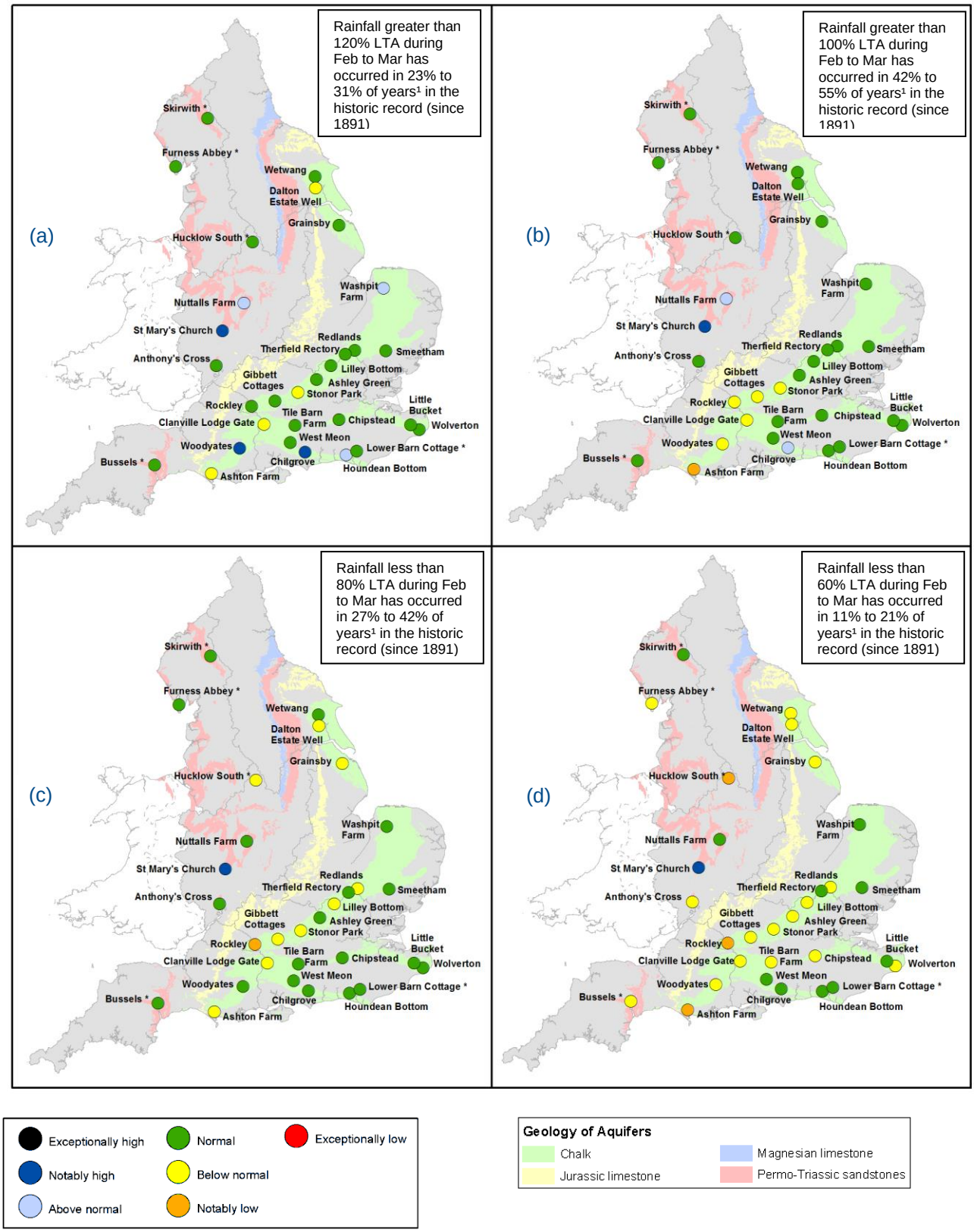


Figure 6.5: Projected groundwater levels at key indicator sites at the end of March 2022. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February 2022 and March 2022 (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC. Crown copyright all rights reserved. Environment Agency 100024198, 2021.

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

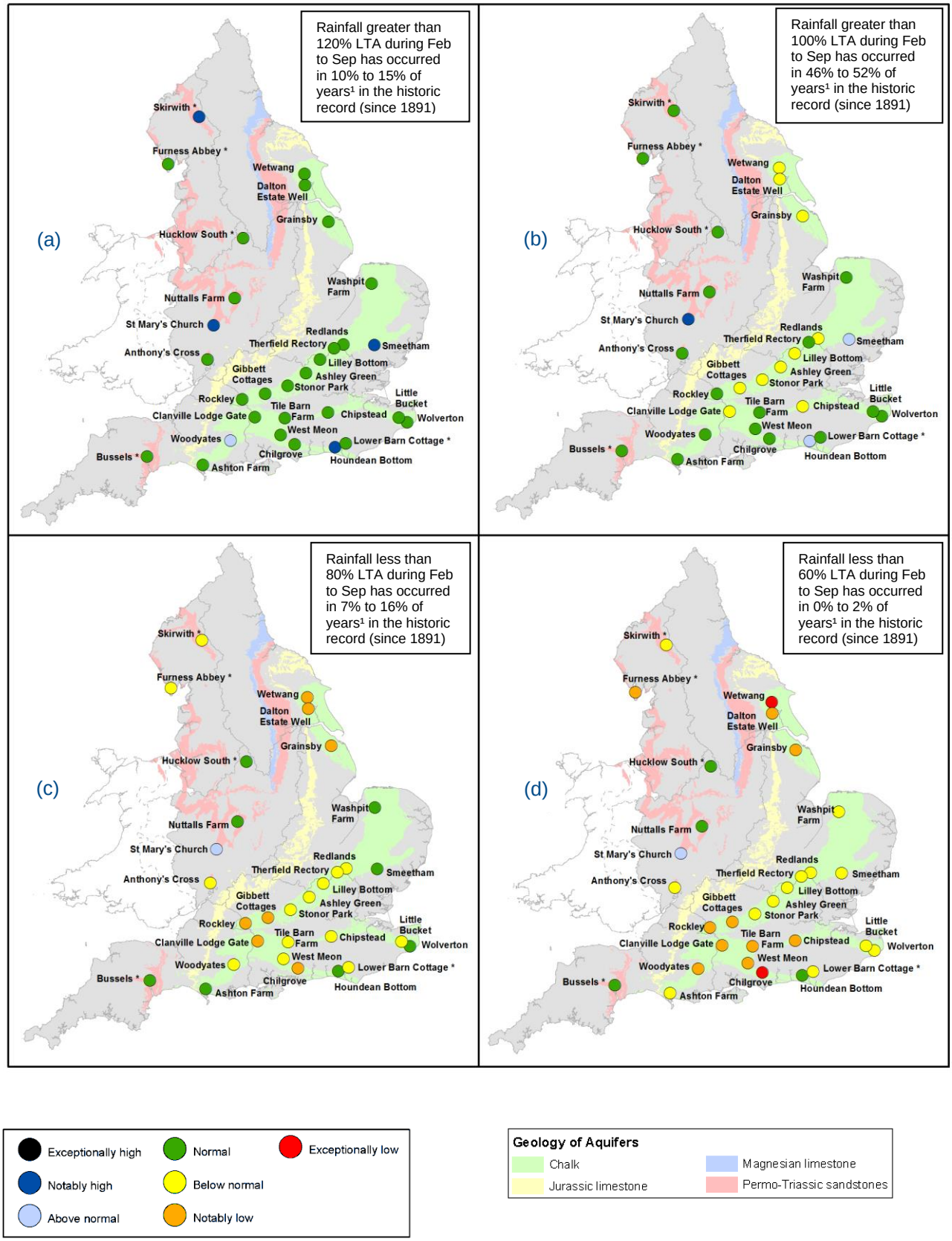
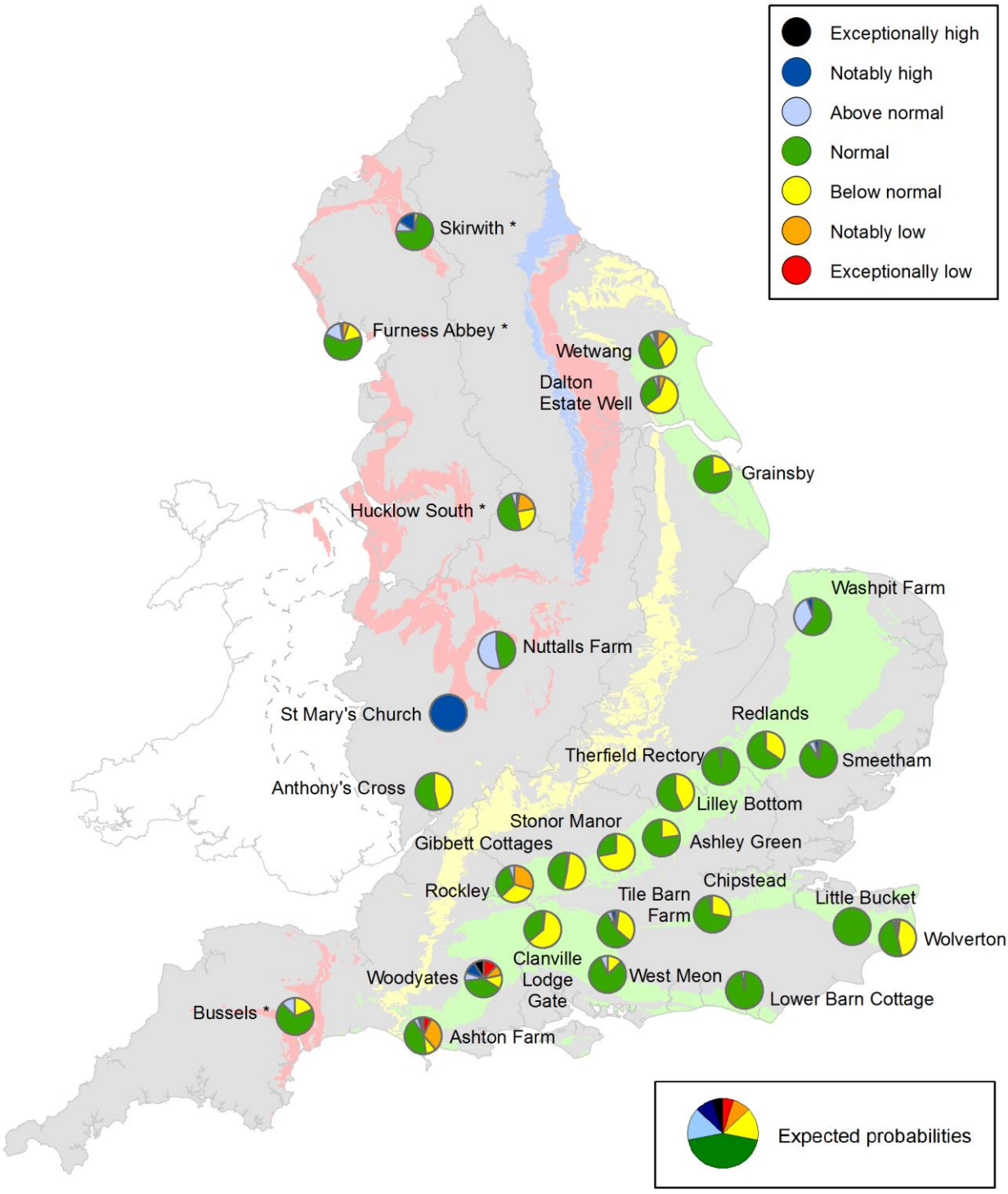


Figure 6.6: Projected groundwater levels at key indicator sites at the end of September 2022. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February 2022 and September 2022 (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC Crown copyright. All rights reserved. Environment Agency 100024198 2021.

* 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 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, 2021.

** Projections for these sites are produced by BGS*

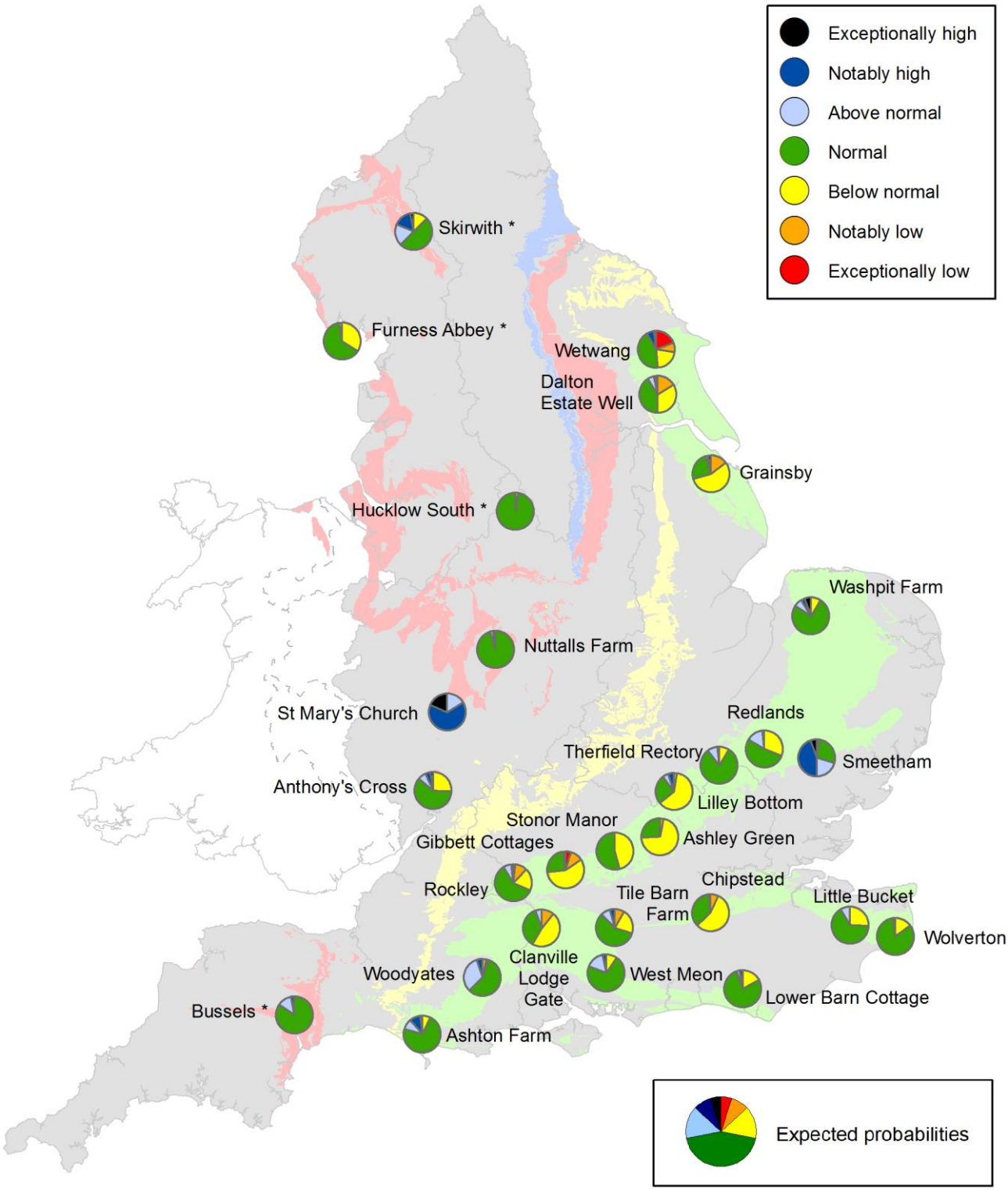


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Figure 6.8: Probabilistic ensemble projections of groundwater levels at key indicator sites at the end of Sept 2022. Pie charts indicate probability, based on climatology, of the groundwater level at each site being e.g. exceptionally low for the time 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, 2021.

* 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