

Monthly water situation report: East Anglia

1 Summary - July 2024

After a dry June, July continued the trend of the past 12 months with high rainfall volumes across the East Anglian region. This rainfall continued to exert influence over the groundwater volumes and river flows which remained healthy, despite a dry second half of the month. The soil moisture deficit increased significantly towards the end of the month and is now within normal range for the Area.

1.1 Rainfall

High rainfall at the start of July was above normal compared to the long-term average for the month. The past three months have also produced rainfall totals above normal, despite a below average rainfall in June. Over the longer time periods, the 6-month and 12-month running totals remain exceptionally high for the region overall. The highest rainfall total since records began, in 1871, have been recorded for 8 catchments in the Area, as well as for East Anglia as a whole, over the last 12-month period of rainfall. June remains the outlier as the only month to have produced below average rainfall totals over the past 12 months.

1.2 Soil moisture deficit and recharge

The soil moisture deficit significantly increased towards the end of the month with the warmer temperatures and significant reduction in rainfall. The Area's soil moisture deficit remains normal for this time of year.

1.3 River flows

River flows ranged between 131% and 220% of the long-term average for July. Groundwater levels remain very high due to the months of continuous recharge, consequently, base flow contributions to rivers have been high. Flows are notably high to exceptionally high for all but two rivers, the Waveney and Yare, which are above normal, due to the lower rainfall totals to the east of East Anglia and the lower runoff responses.

1.4 Groundwater levels

Groundwater levels remain high across East Anglia. All catchments with available data demonstrated above normal, to notably or exceptionally high levels compared to the long-term averages. The warm, dry weather in the second half of this month will have provided little recharge to groundwater stores, and a continued downward trend is noticeable at all groundwater sites, as expected, given the time of year. However, due to the wet winter, groundwater levels remain healthy.

1.5 Reservoir stocks

Reservoir stocks are healthy this month and above the normal operating curve for July. Abberton and Ardleigh are filled just below 90% capacity, while Alton, Grafham and Hanningfield are filled over 90% of capacity. There are currently no concerns with public water supply reservoirs as we approach the end of the summer.

1.6 Forward look

1.6.1 Probabilistic ensemble projections for river flows at key sites

The projections show that the majority of the model runs using current starting conditions and historic rainfall and potential evapotranspiration simulate flows for September 2024 being at least categorised as normal. The only exception to this is the Ely Ouse that is projected to have a 10% chance of below normal flows. By December 2024, model runs suggest a 25% likelihood of flows being below normal or notably low across the rivers.

1.6.2 Probabilistic ensemble projections for groundwater levels in key aquifers

For September 2024, no models suggest groundwater levels could be anything below above average, while Smeetham is unlikely to be below notably high and Therfield Rectory was modelled at exceptionally high through all simulated runs. They show the dominant influence of the winter recharge season in determining groundwater levels throughout the following summer, as well as the continued above average rainfall into the spring and summer months. By March 2025, all boreholes are forecasted to have some probability of normal to below normal groundwater levels, suggesting a decline in the influence of the wet 2023 winter.

Author: Hydrology Team, hydrology-ean-and-lna@environment-agency.gov.uk

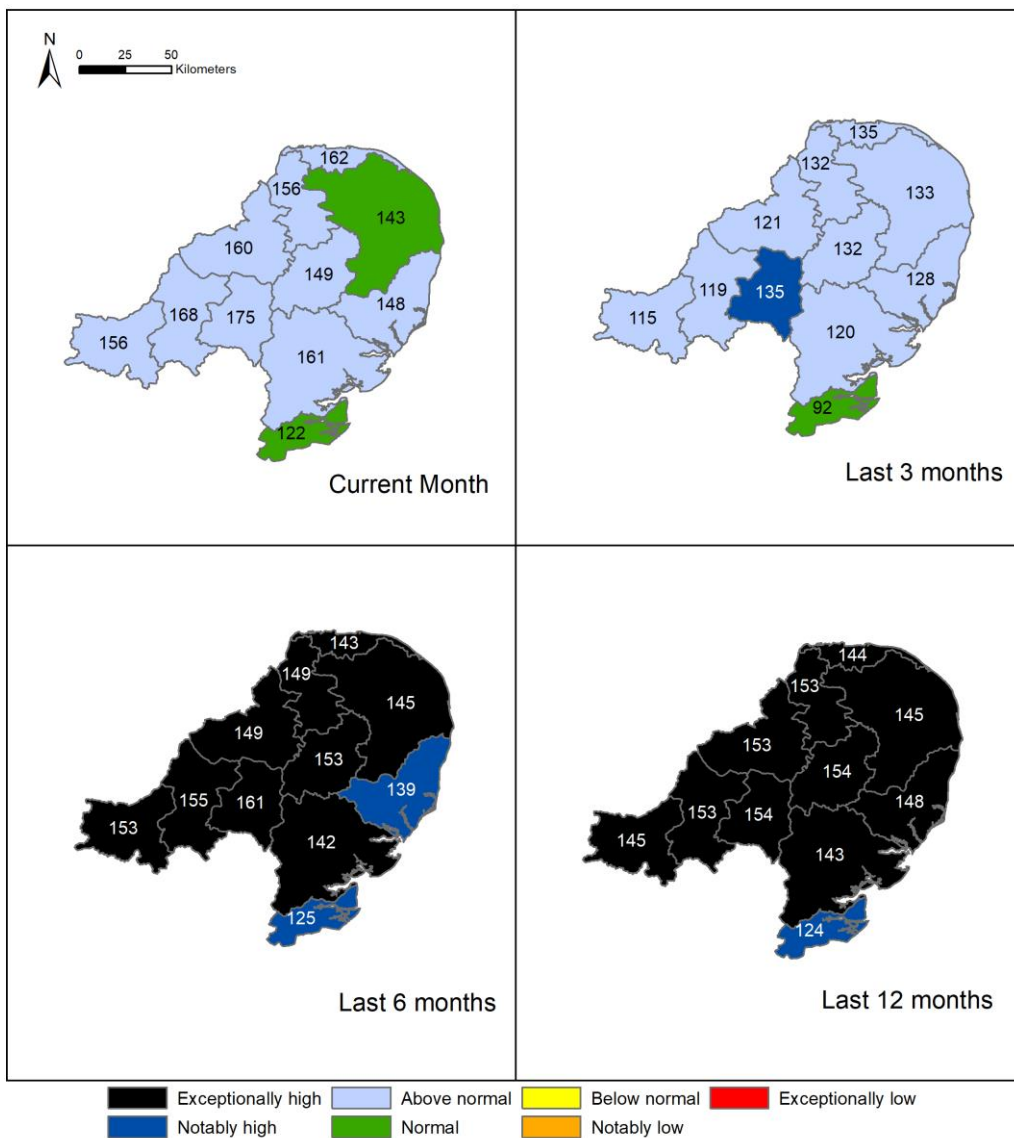
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Contact details: 03708 506 506

2 Rainfall

2.1 Rainfall map

Figure 2.1: Total rainfall for hydrological areas across East Anglia, expressed as a percentage of long term average rainfall for the current month (up to 31 July 2024), the last 3 months, the last 6 months, and the last 12 months. Category classes are based on an analysis of respective historic totals. Table available in the appendices with detailed information.



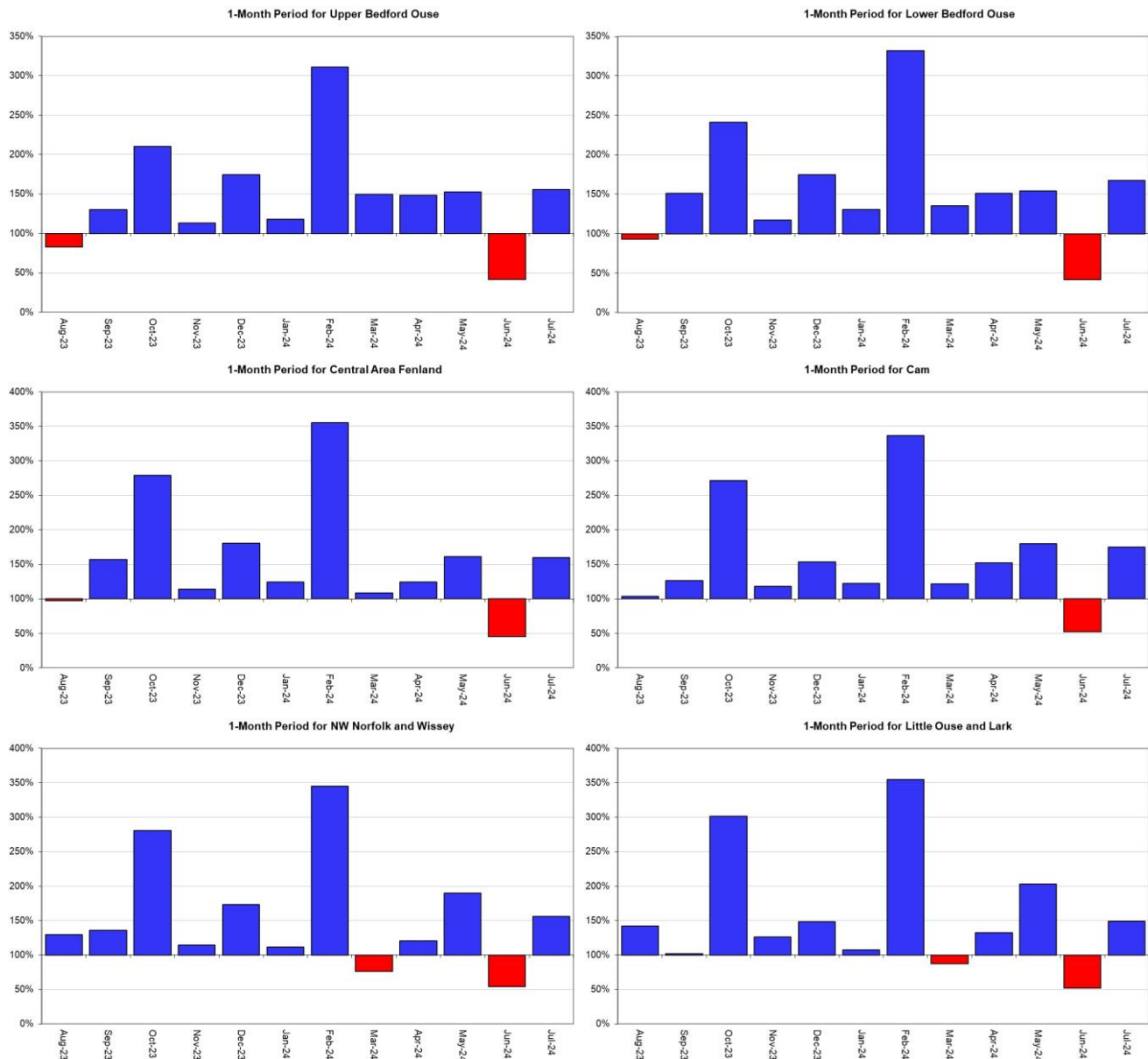
HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office. Crown copyright, 2024). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

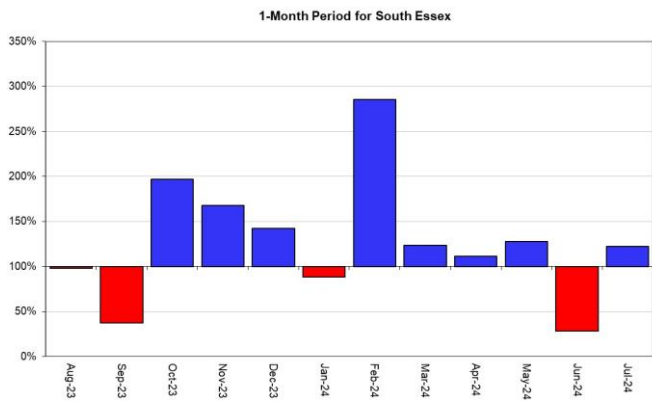
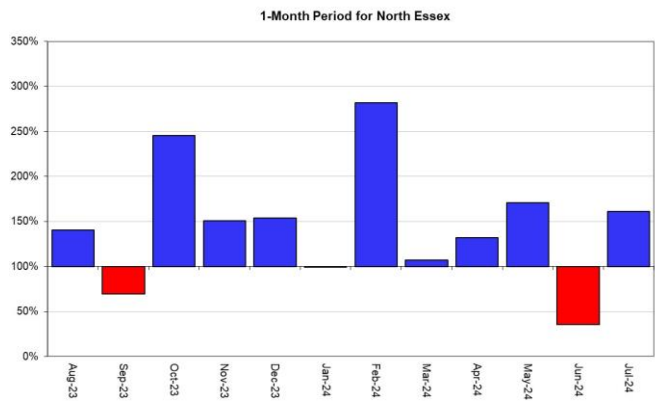
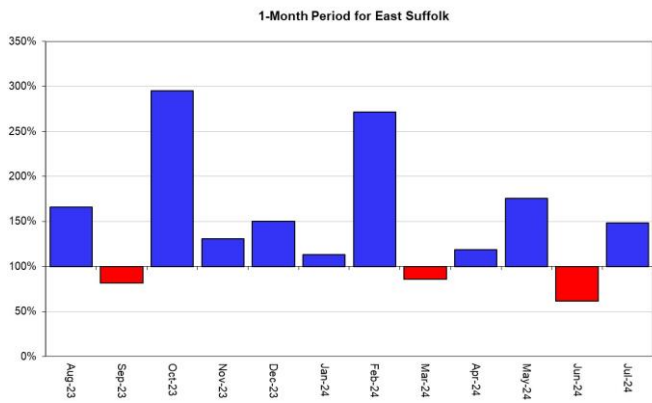
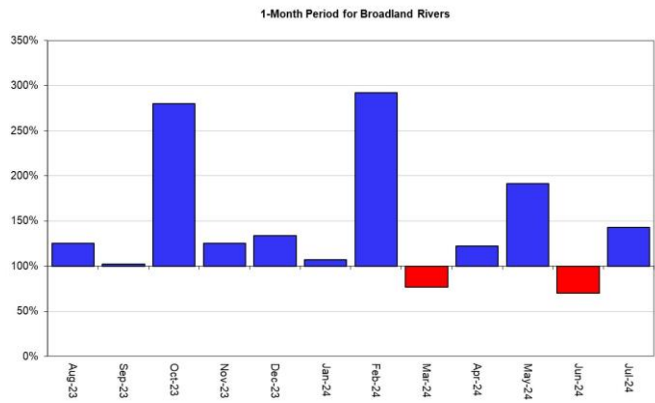
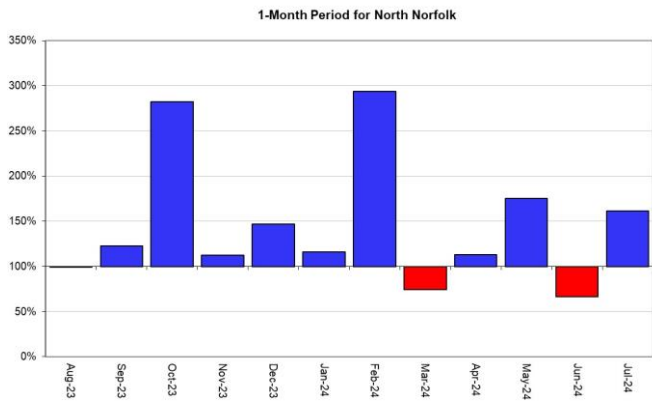
2.2 Rainfall charts

Figure 2.2: Monthly rainfall totals for the past 12 months as a percentage of the 1961 to 1990 long term average for each region and for England.

■ Above average rainfall

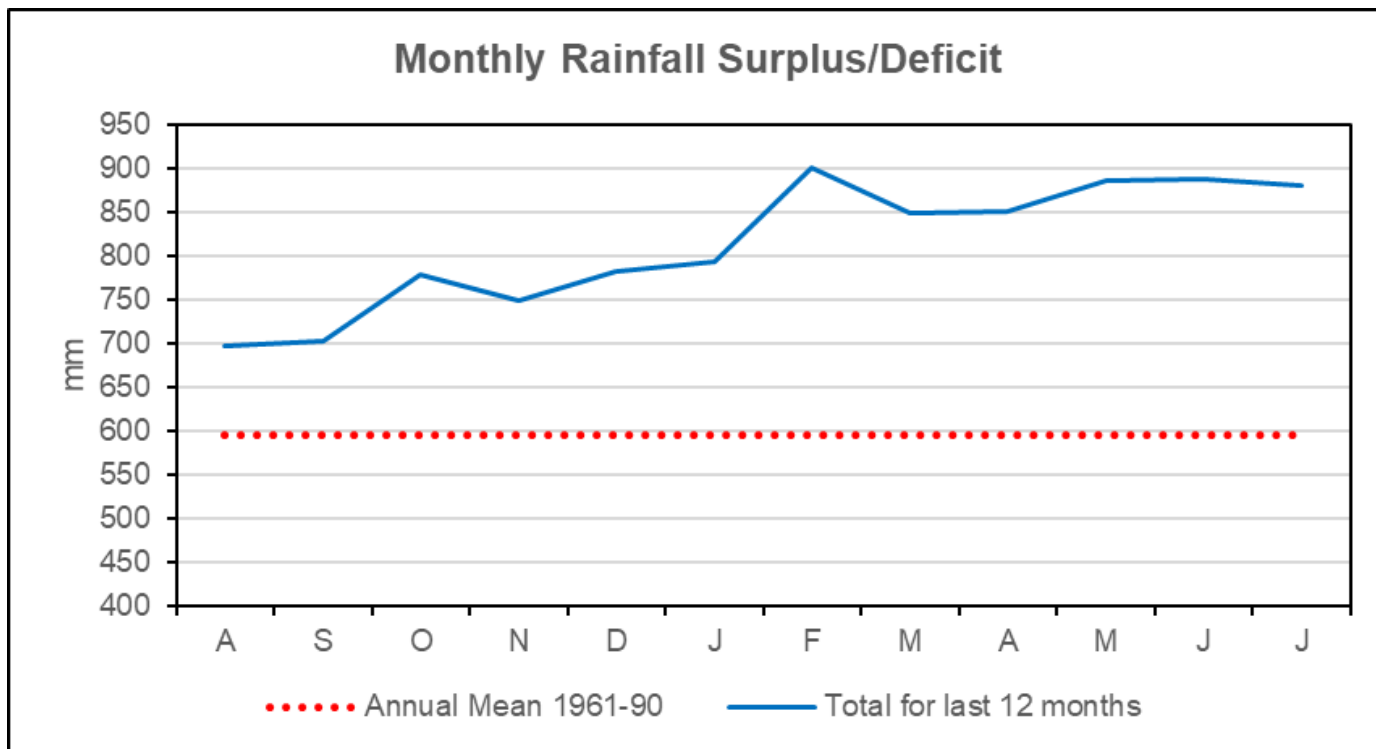
■ Below average rainfall





HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

2.3 Monthly rainfall surplus deficit chart

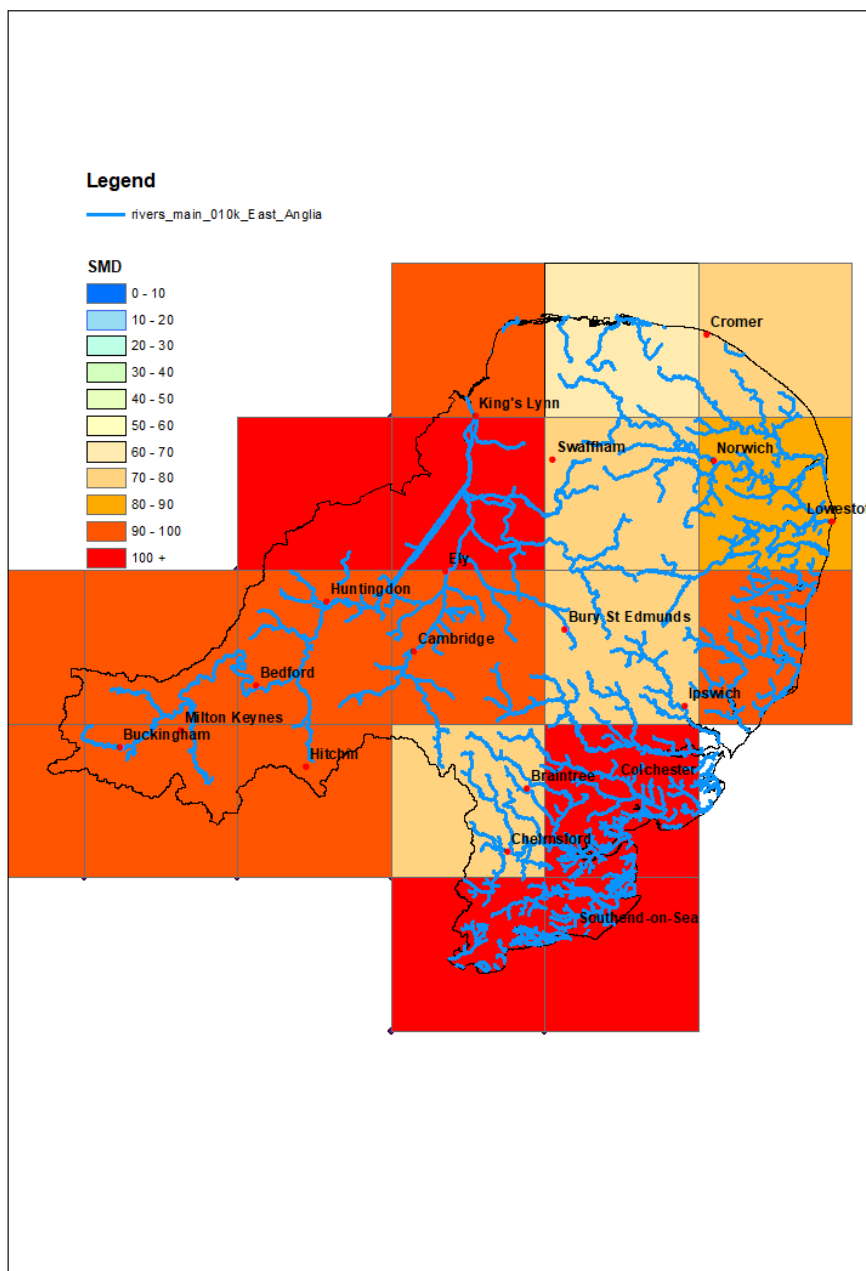


HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

3 Soil moisture deficit

3.1 Soil moisture deficit map

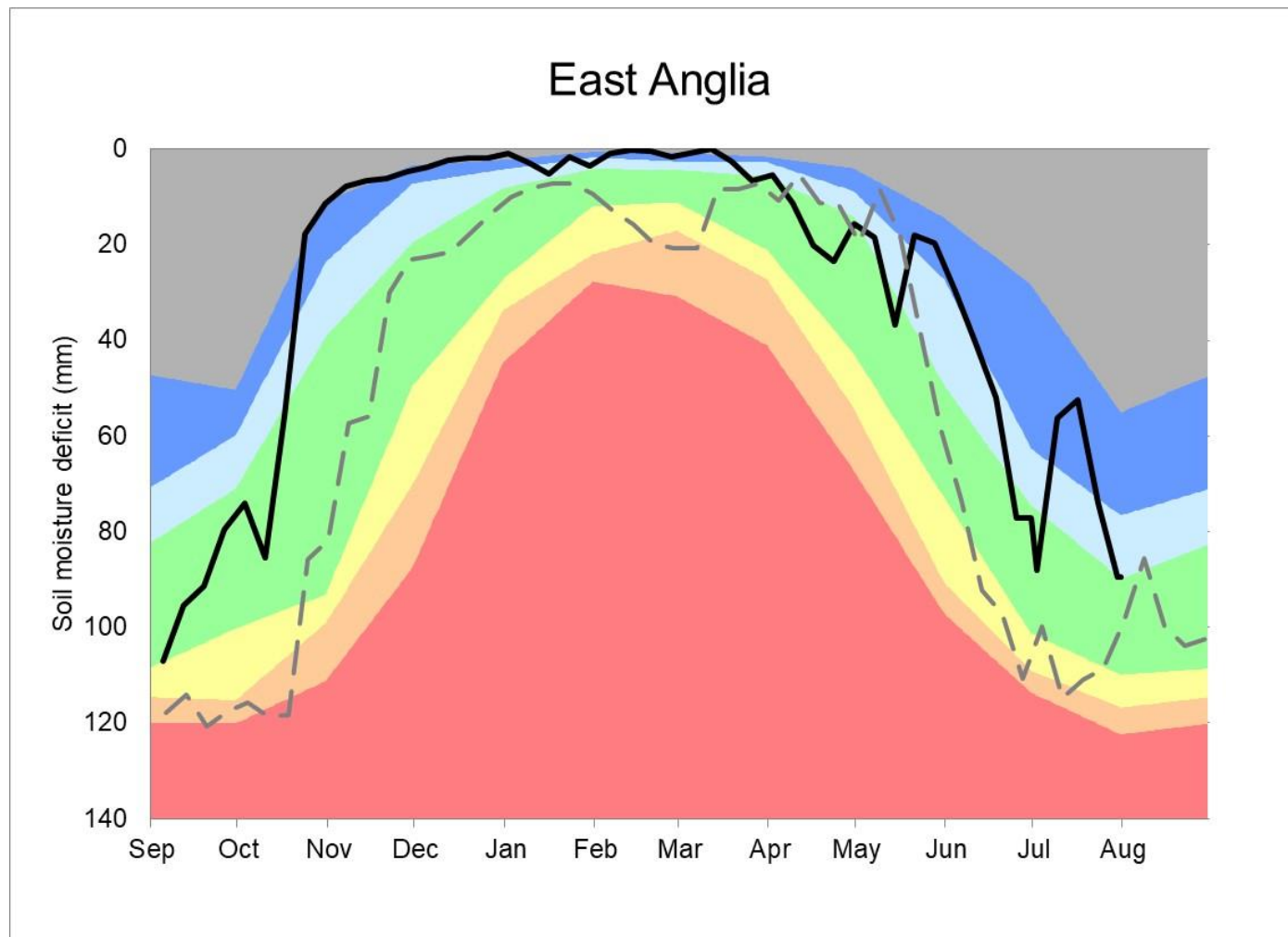
Figure 3.1: Soil moisture deficit values for 31 July 2024. Values based on the weekly MORECS data for real land use.



(Source: Met Office. Crown copyright, 2024). All rights reserved. Environment Agency, 100024198, 2024.

3.2 Soil moisture deficit charts

Figure 3.2: Latest soil moisture deficit compared to an analysis of historic 1961 to 1990 long term data set. Weekly MORECS data for real land use.

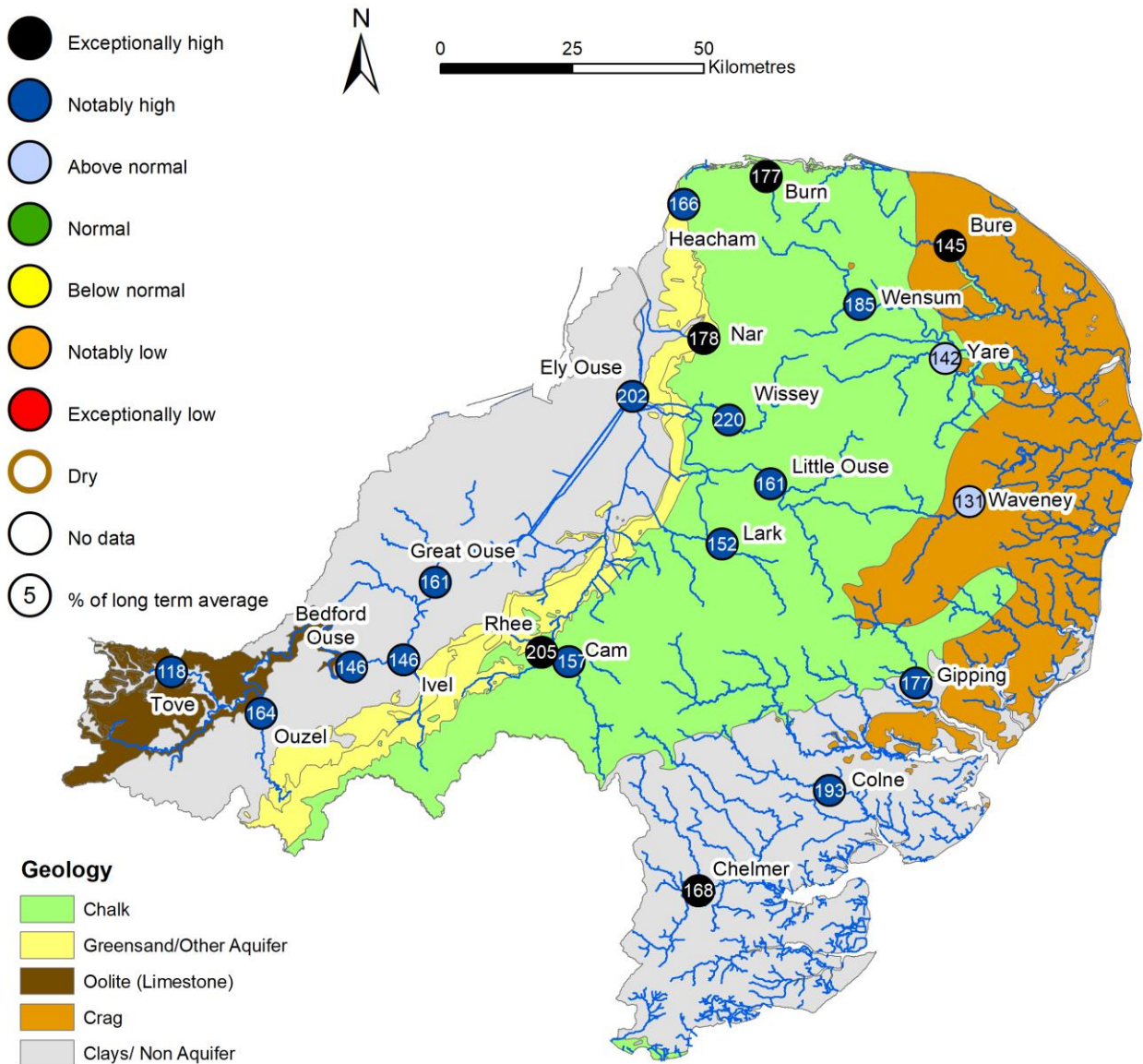


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4 River flows

4.1 River flows map

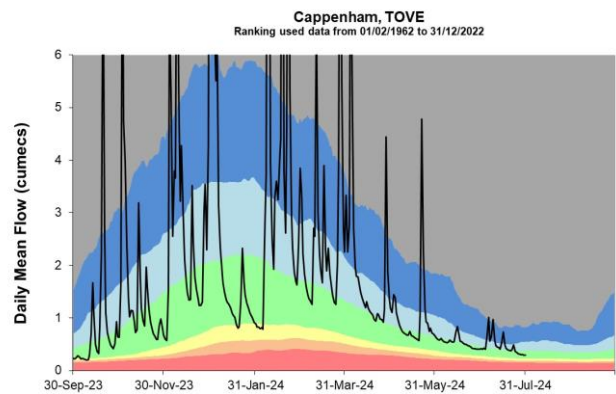
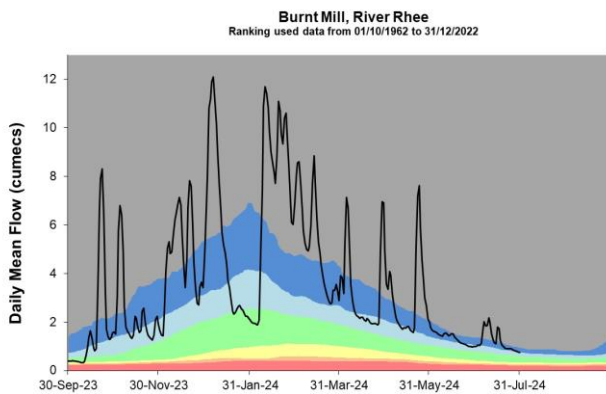
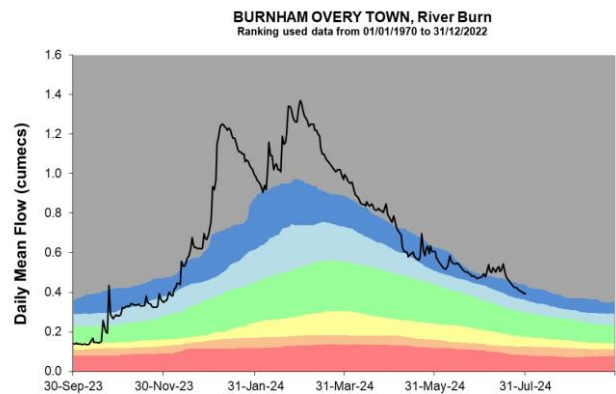
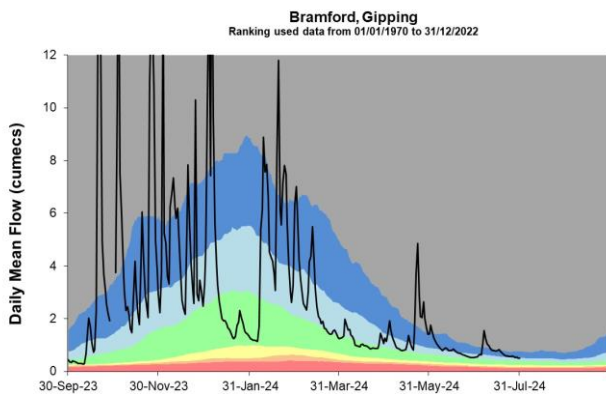
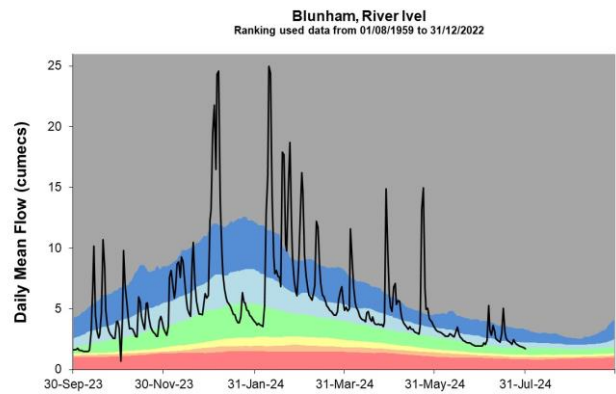
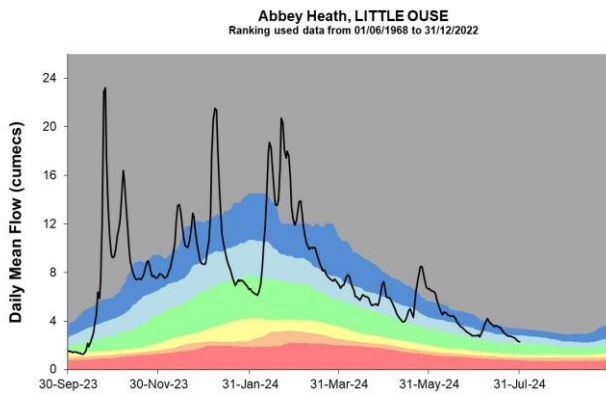
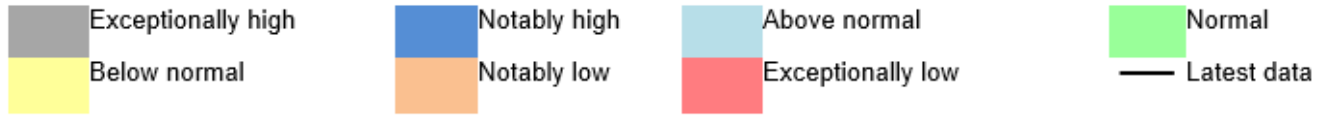
Figure 4.1: Monthly mean river flow for indicator sites for July 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic July monthly means Table available in the appendices with detailed information.

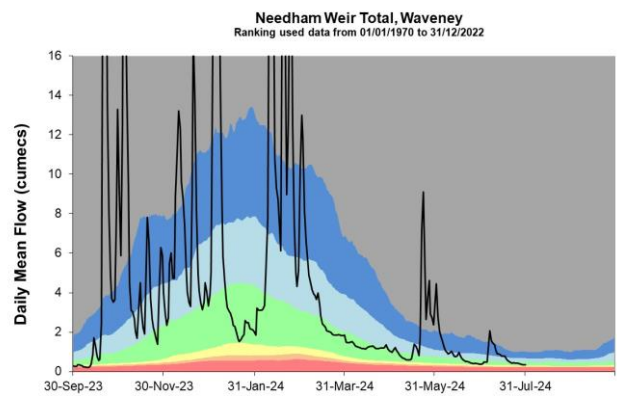
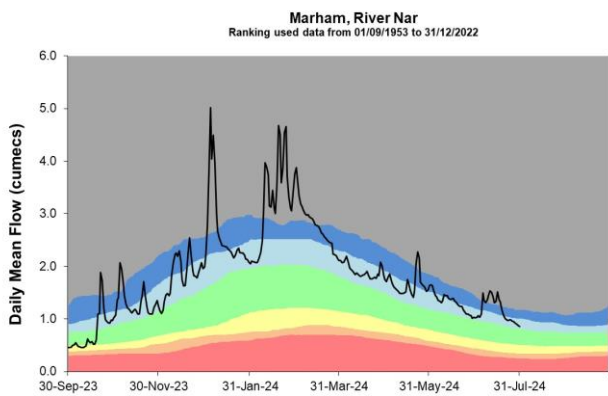
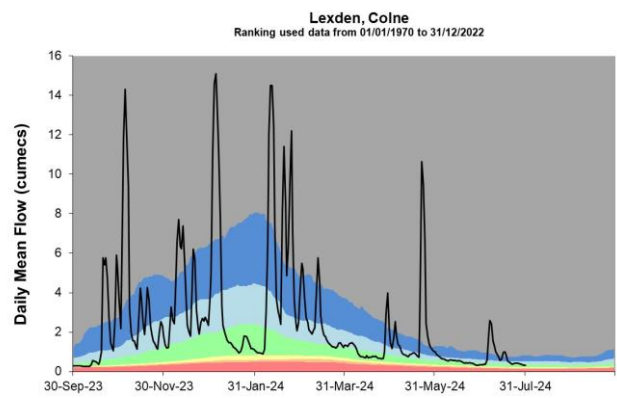
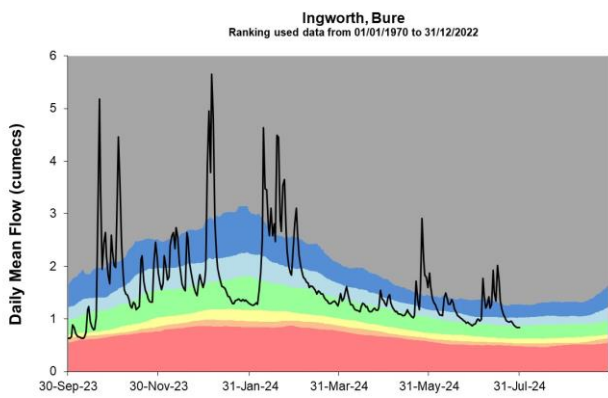
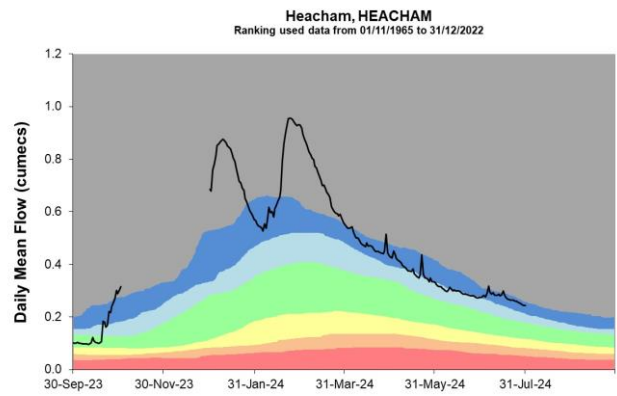
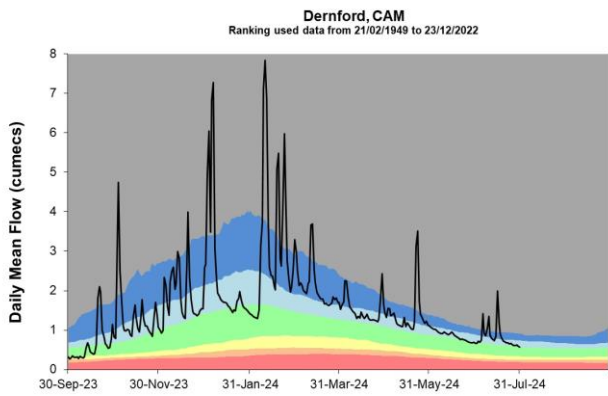
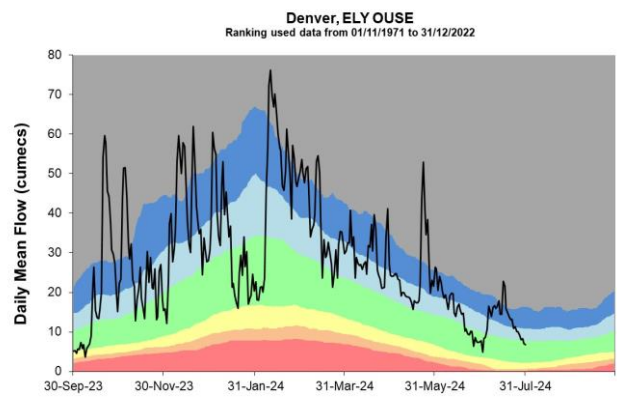
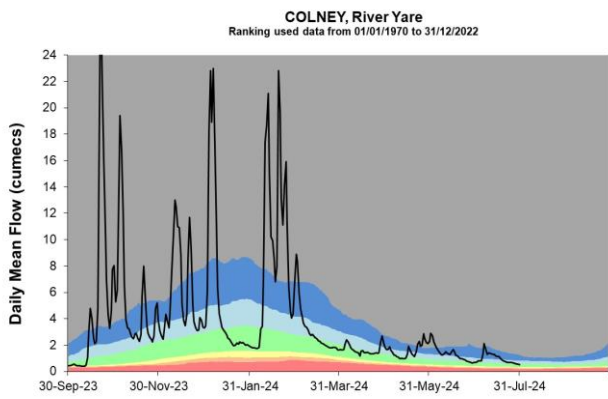


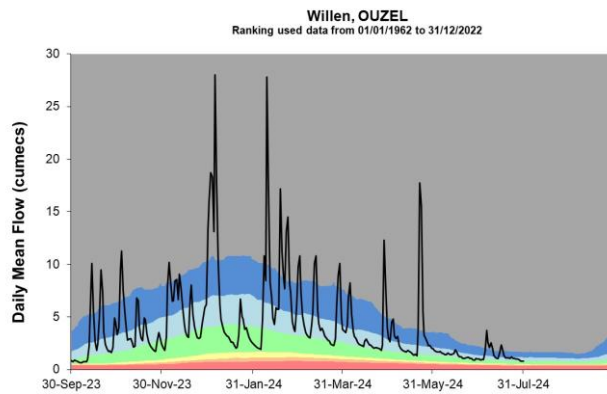
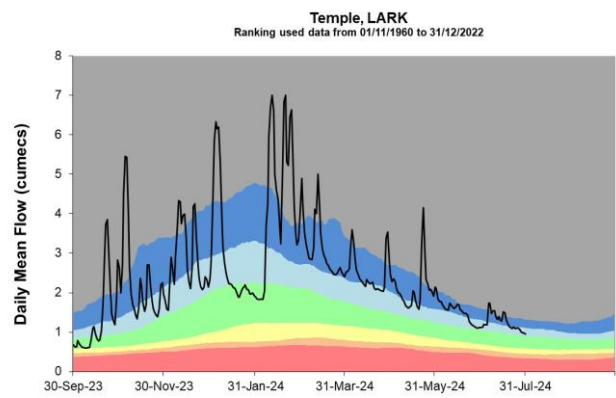
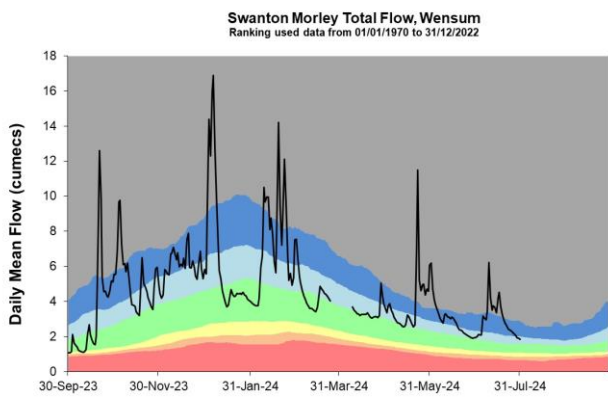
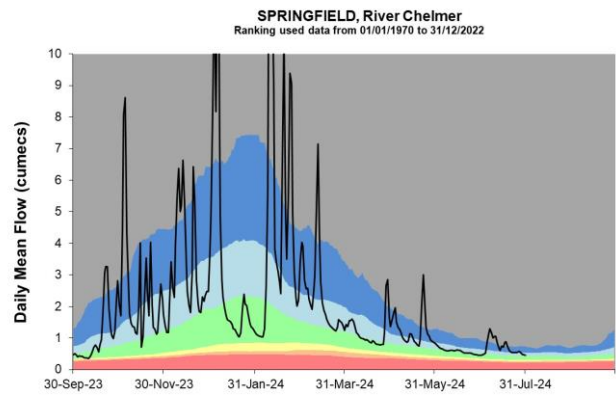
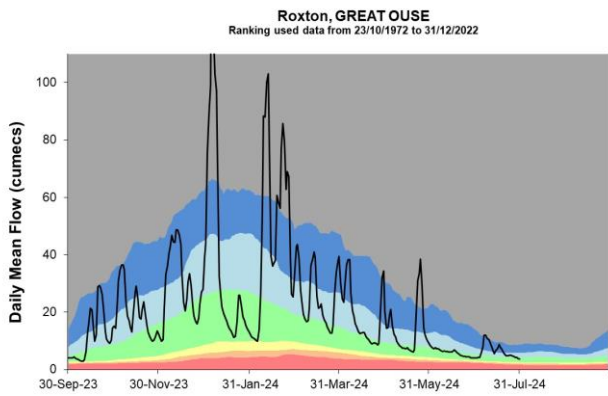
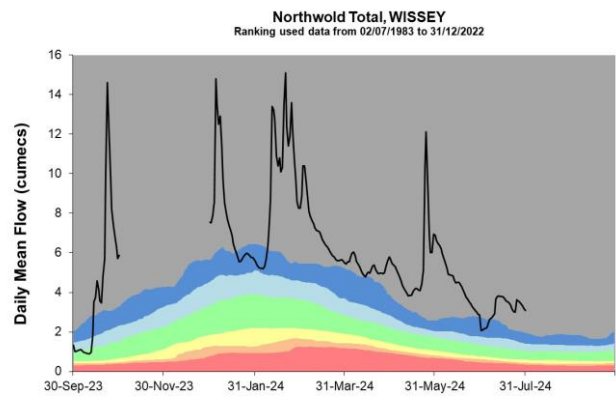
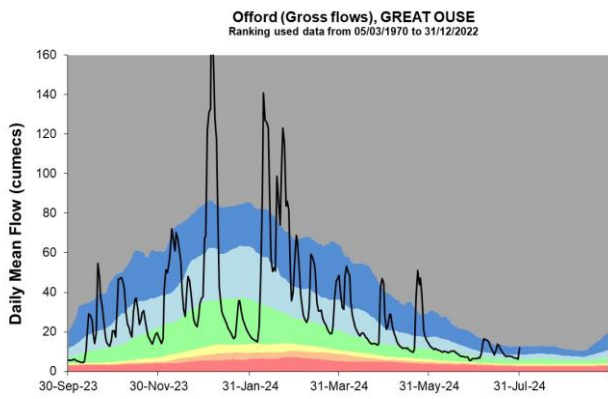
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

4.2 River flow charts

Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows, and long term maximum and minimum flows.





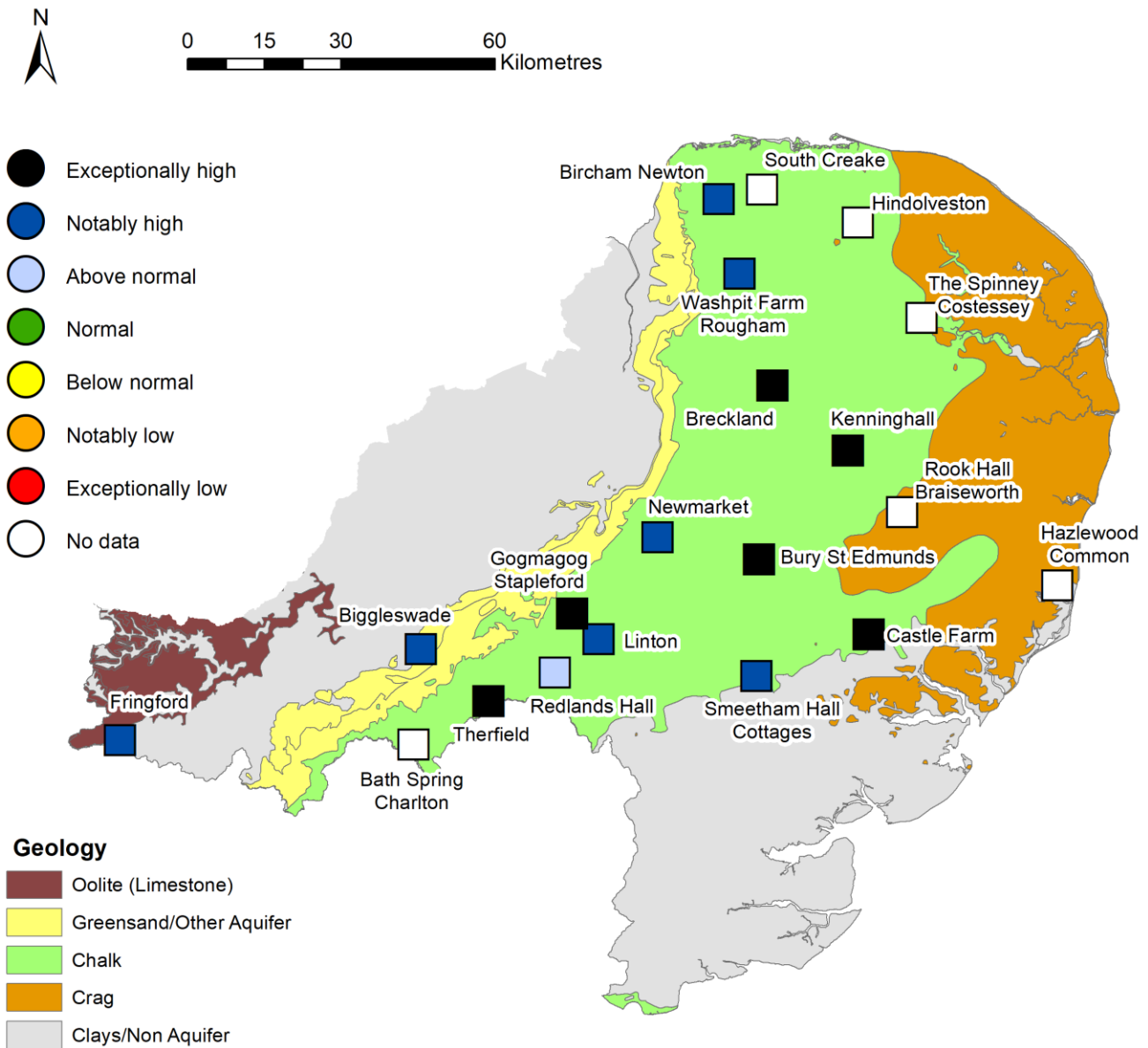


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

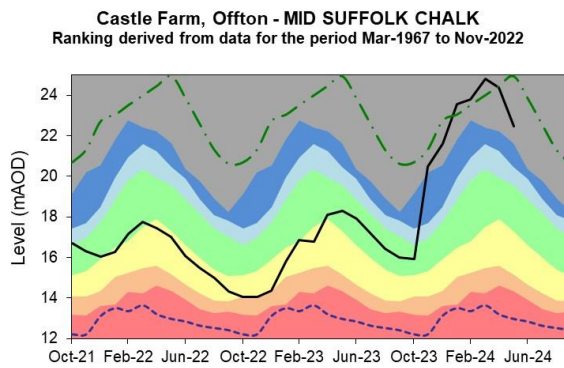
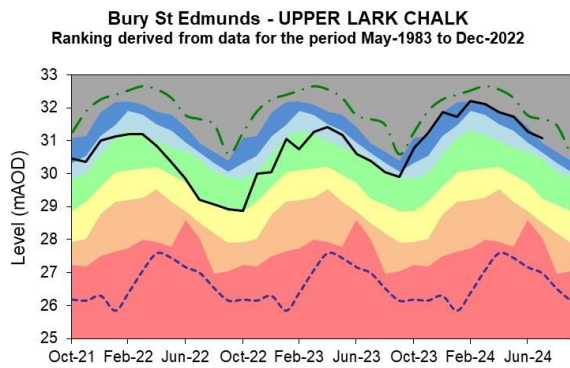
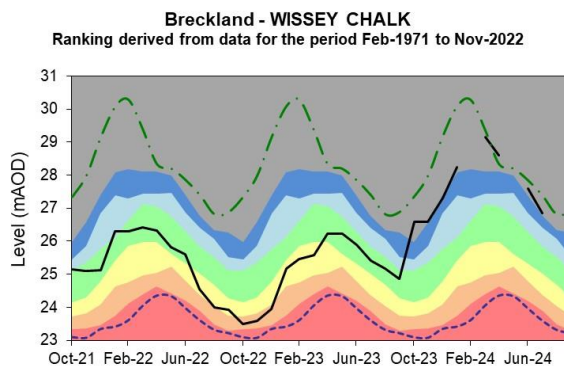
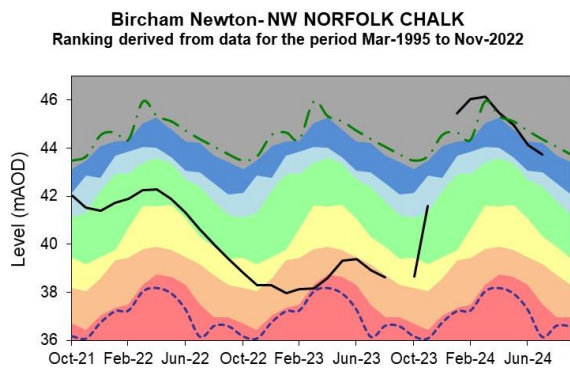
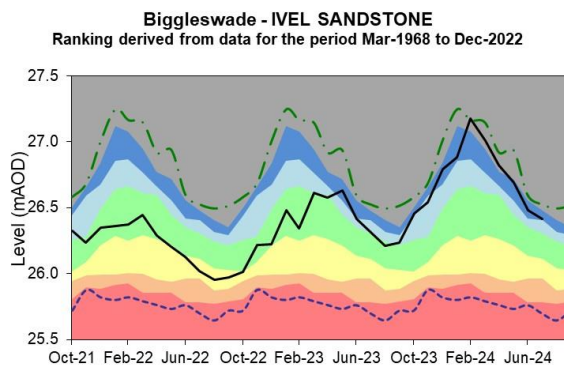
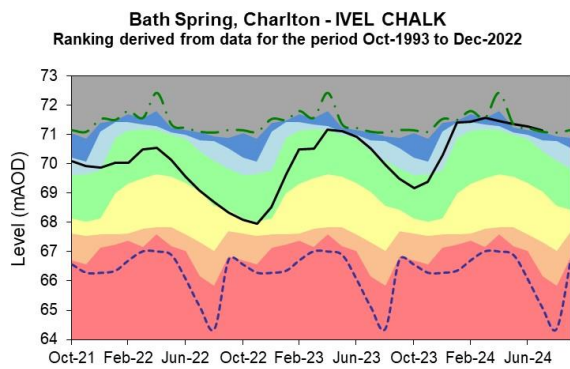
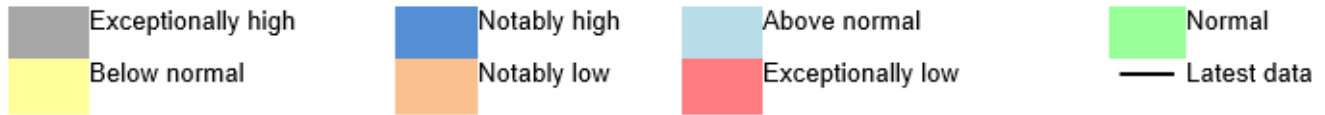
Figure 5.1: Groundwater levels for indicator sites at the end of July 2024, classed relative to an analysis of respective historic July levels. Table available in the appendices with detailed information.



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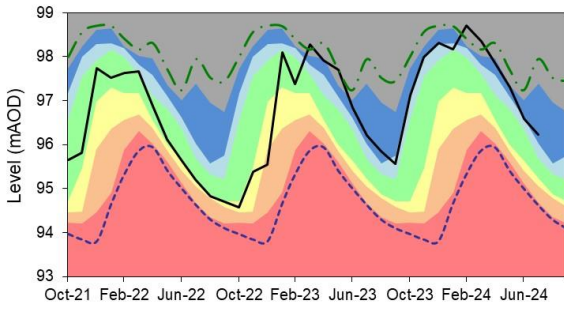
5.2 Groundwater level charts

Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 22 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.



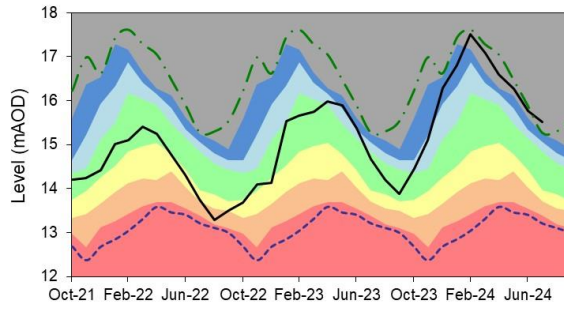
Fringford - GREAT OOLITE

Ranking derived from data for the period Sep-1980 to Dec-2022



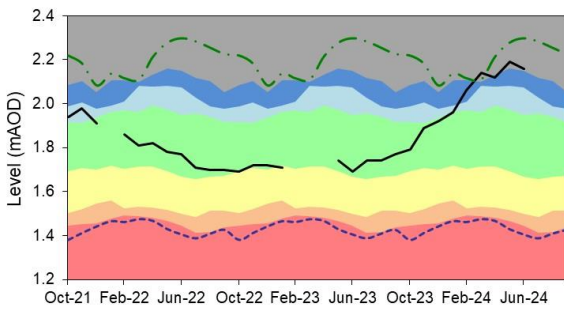
Gog Magog, Stapleford - CAM CHALK

Ranking derived from data for the period Jan-1980 to Dec-2022



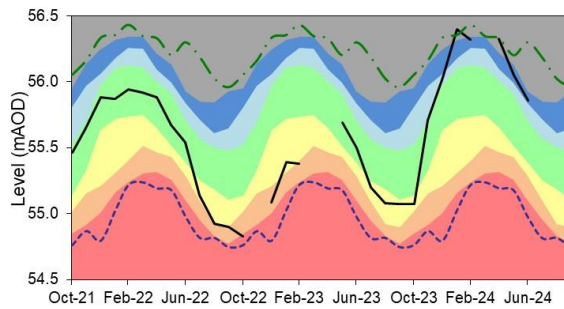
Hazlewood Common - SUFFOLK CRAG

Ranking derived from data for the period Oct-1988 to Nov-2022



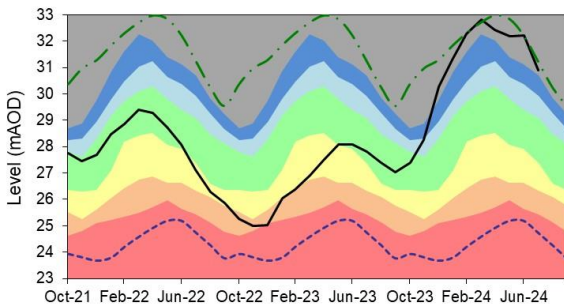
Hindolveston - NORFOLK CHALK

Ranking derived from data for the period Sep-1984 to Nov-2022



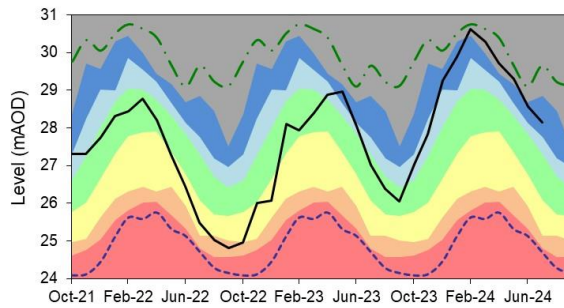
Kenninghall - LITTLE OUSE CHALK

Ranking derived from data for the period Aug-1973 to Dec-2022



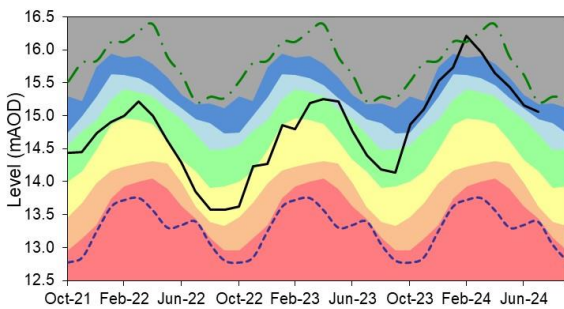
Linton-CAM CHALK

Ranking derived from data for the period Jan-1980 to Dec-2022



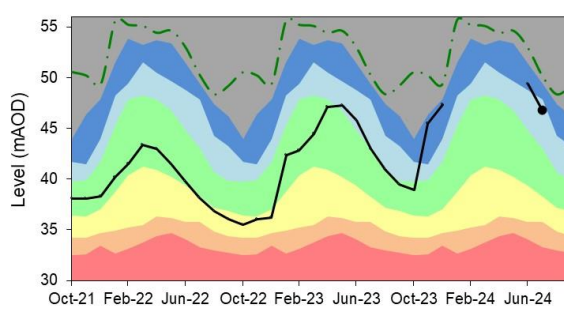
Newmarket - SNAIL CHALK

Ranking derived from data for the period Feb-1983 to Dec-2022

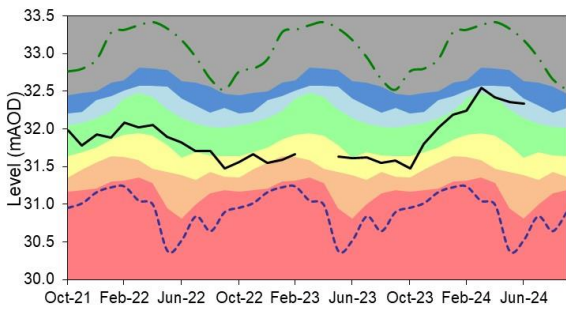


Redlands Hall, Ickleton - CAM CHALK

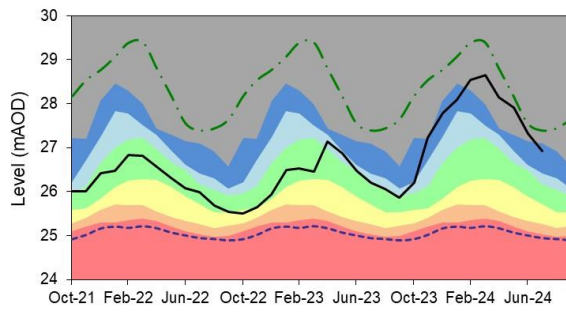
Ranking derived from data for the period Aug-1963 to Dec-2022



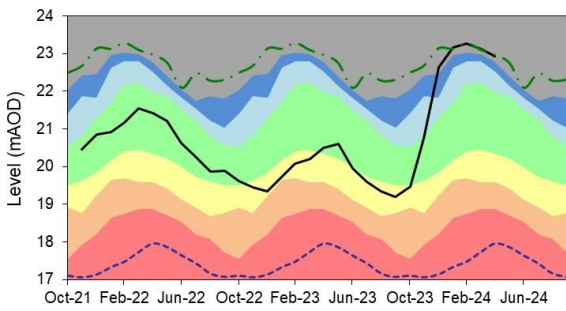
Rook Hall, Braiseworth-SUFFOLK CHALK
 Ranking derived from data for the period Jan-1980 to Nov-2022



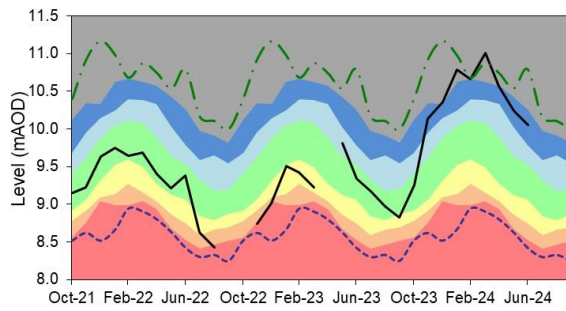
Smeetham Hall Cottages, Bulmer - ESSEX CHALK
 Ranking derived from data for the period Jan-1964 to Jul-2022



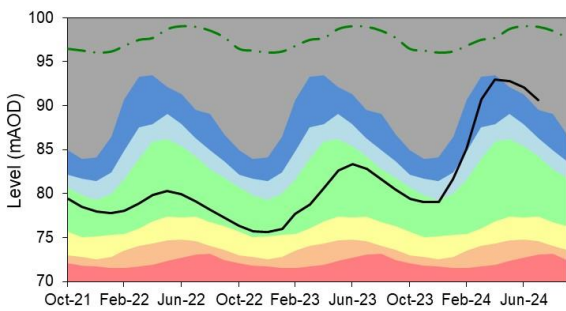
Old Primary School, South Creake, NORFOLK CHALK
 Ranking derived from data for the period Oct-1971 to Aug-2021



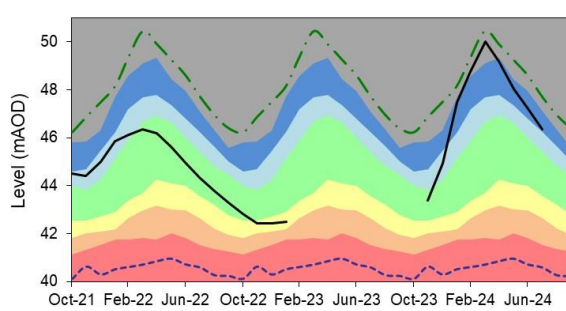
The Spinney, Costessey- WENSUM CHALK
 Ranking derived from data for the period Oct-1971 to Nov-2022



Therfield Rectory - N HERTS CHALK
 Ranking derived from data for the period Jan-1883 to Nov-2022



Washpit Farm, Rougham - NW NORFOLK CHALK
 Ranking derived from data for the period May-1950 to Dec-2022

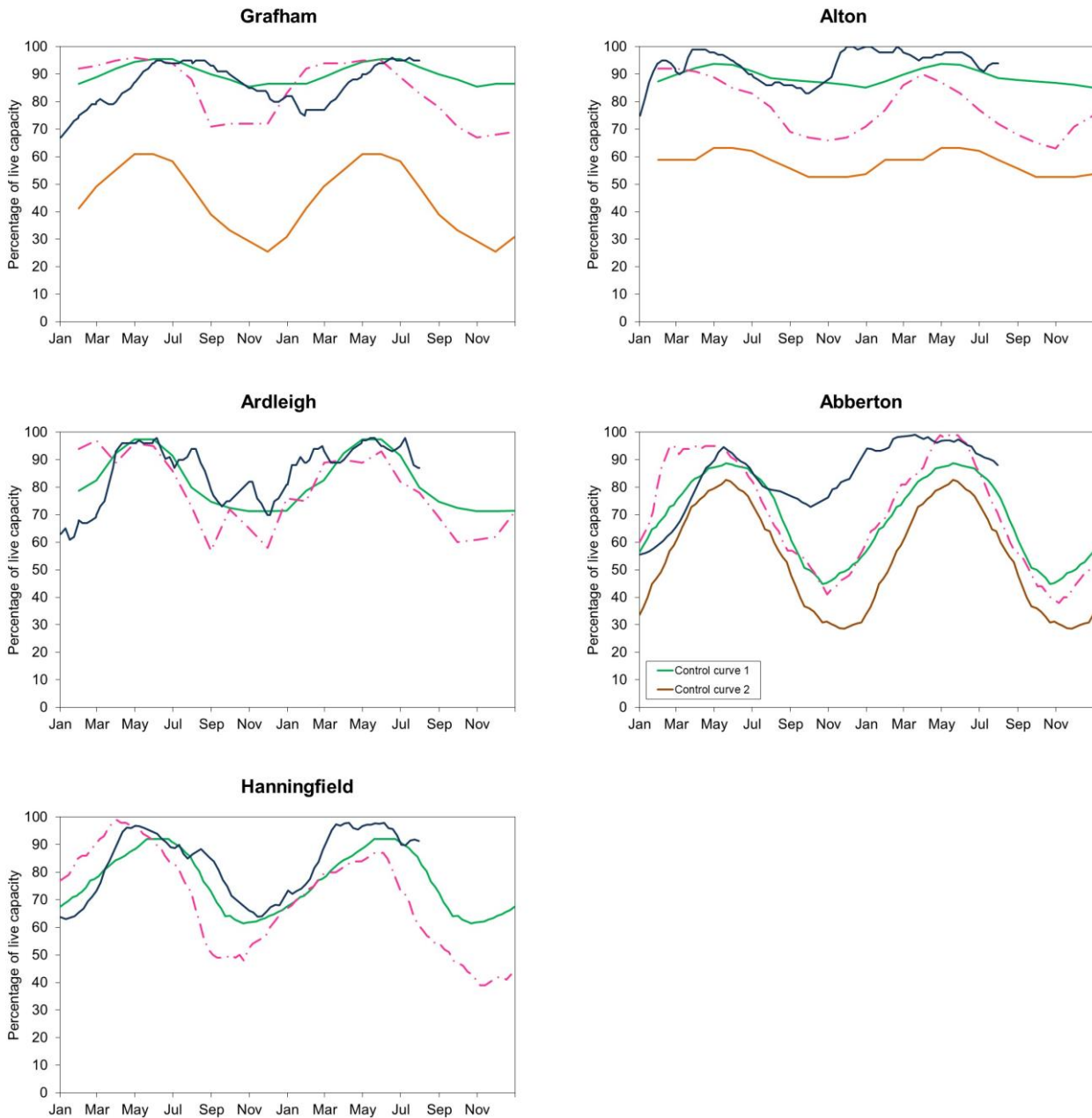


Source: Environment Agency, 2024.

6 Reservoir stocks

Figure 6.1: End of month regional reservoir stocks compared to the normal operating curve, drought curve and dry 1995-1996 stocks. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in length.

— 2023-2024 — Normal Operating Curve — Drought Alert Curve - - 1995-1996

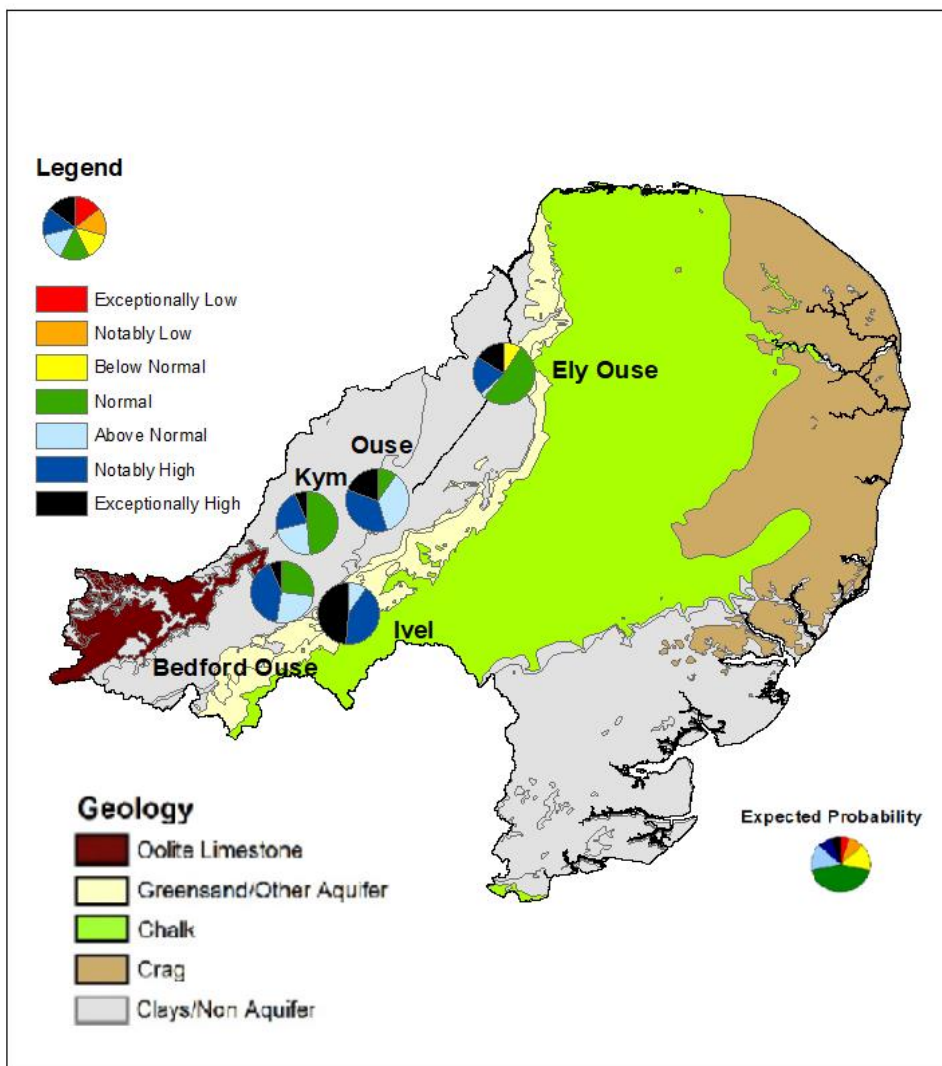


(Source: water companies).

7 Forward look

7.1 Probabilistic ensemble projection of river flows at key sites in September 2024

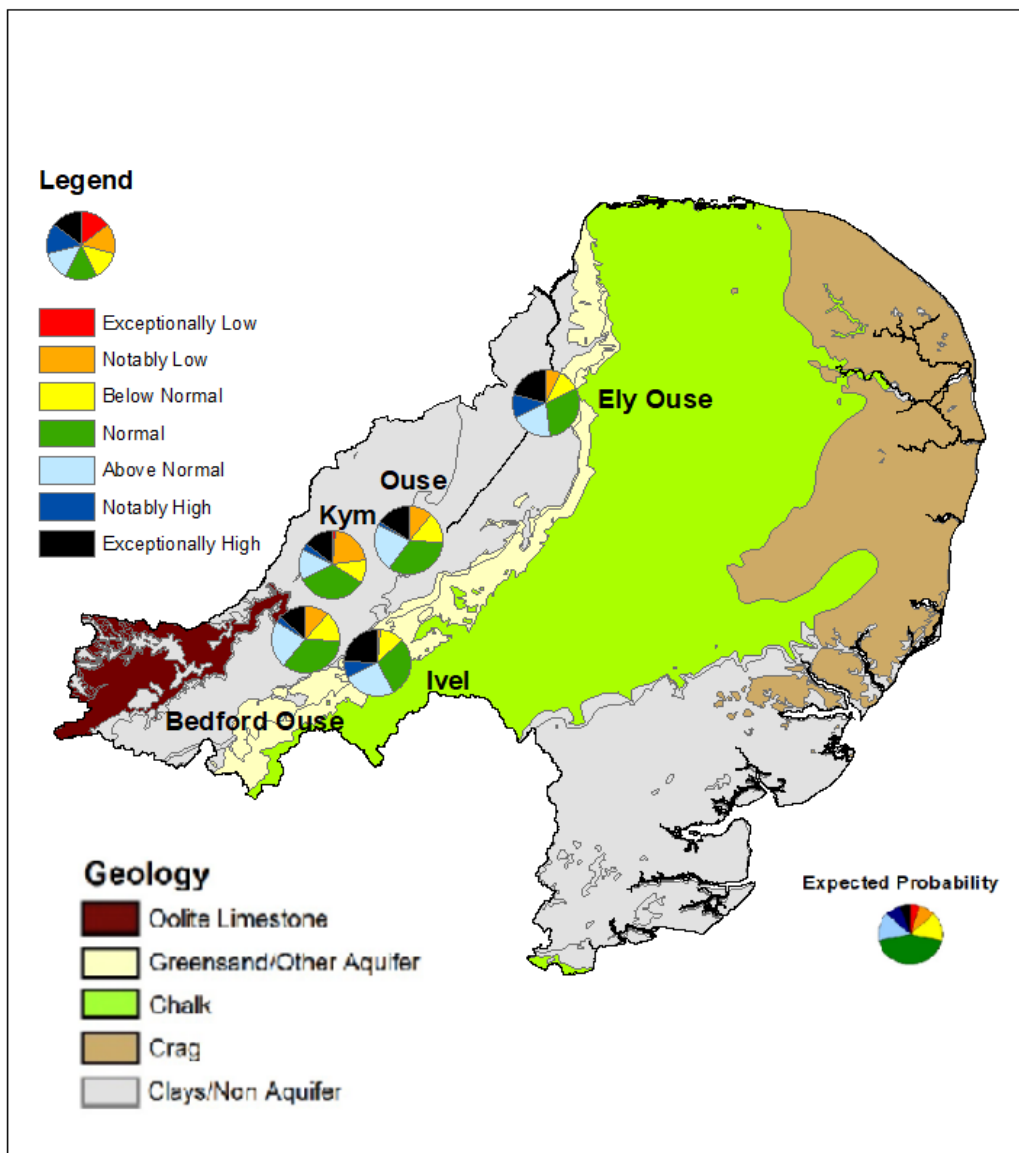
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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



Pie charts indicate probability, based on climatology, of the surface water flow at each site being, for example, exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024.

7.2 Probabilistic ensemble projection of river flows at key sites in December 2024

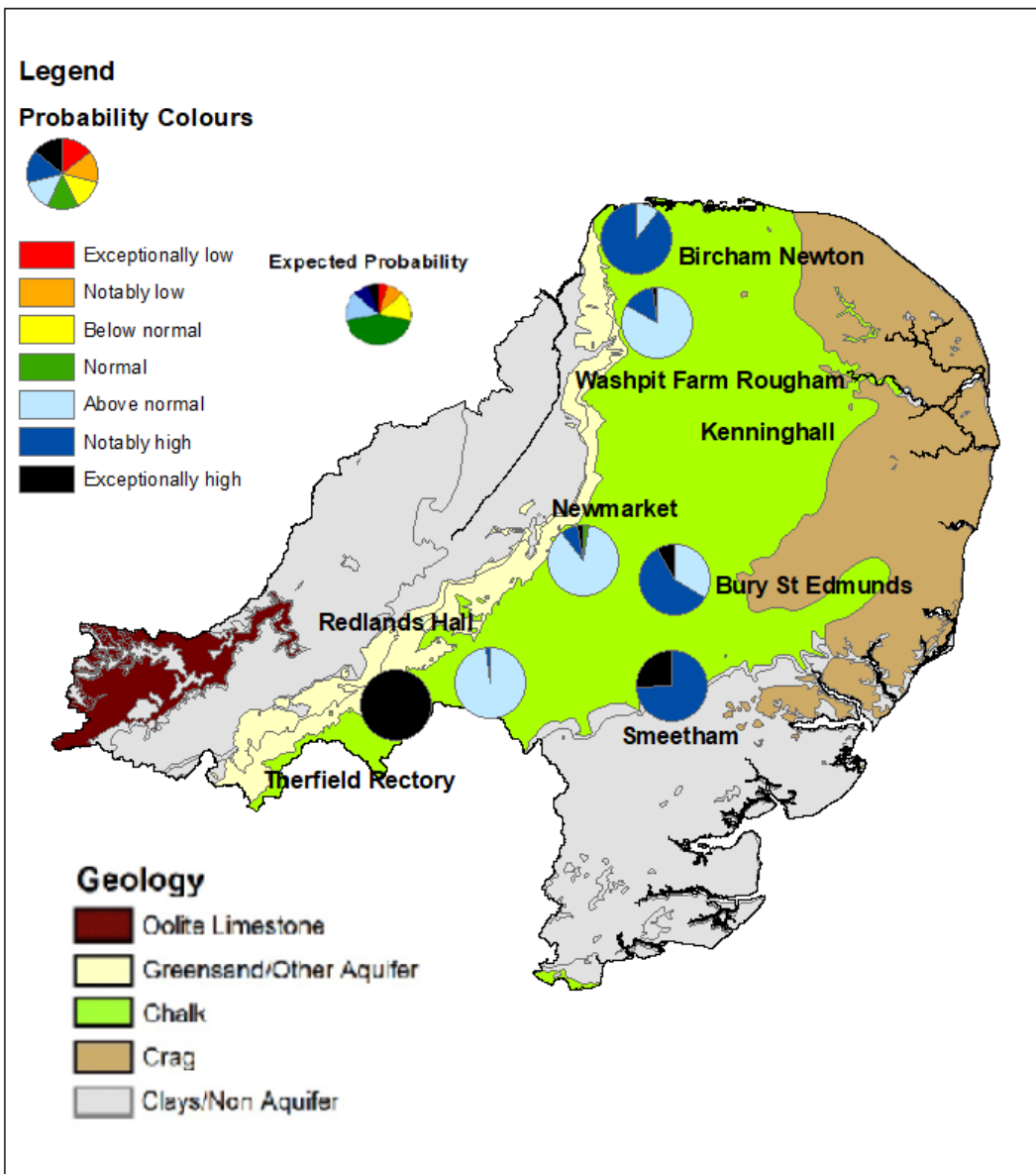
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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



Pie charts indicate probability, based on climatology, of the surface water flow at each site being, for example, exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

7.3 Probabilistic ensemble projection of groundwater levels at key sites in September 2024

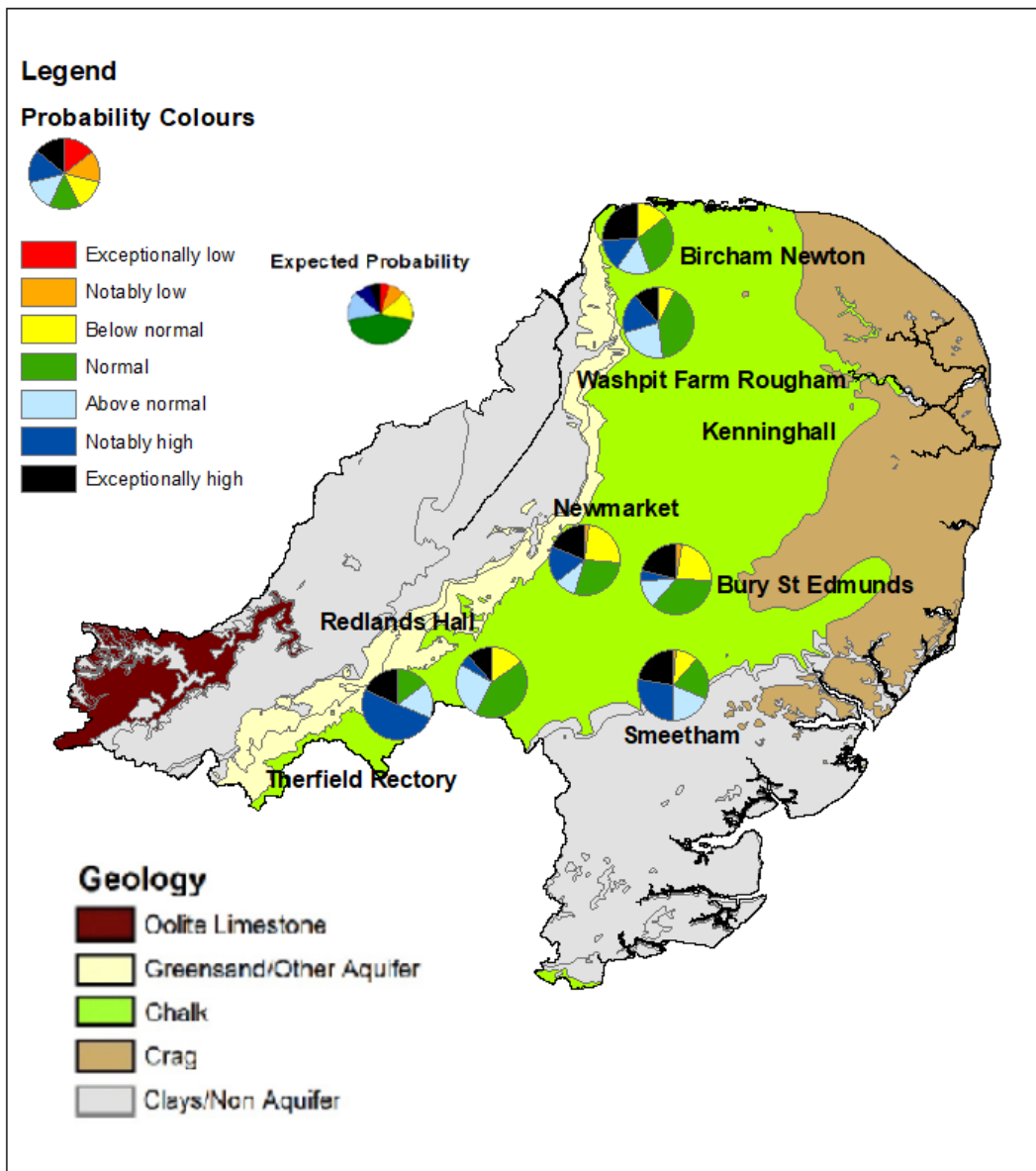
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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



Pie charts indicate probability, based on climatology, of the groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency)
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7.4 Probabilistic ensemble projection of groundwater levels at key sites in March 2025

Table available in the appendices with detailed information. 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.



Pie charts indicate probability, based on climatology, of the groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency)
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8 Glossary

8.1 Terminology

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 and 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, usually based on the period 1961 to 1990. However, the period used may vary by parameter being reported on (see figure captions for details).

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 by 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 (for example, 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).

8.2 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.

9 Appendices

9.1 Rainfall table

Hydrological area	Jul 2024 rainfall % of long term average 1961 to 1990	Jul 2024 band	May 2024 to July cumulative band	Feb 2024 to July cumulative band	Aug 2023 to July cumulative band
Broadland Rivers	143	Normal	Above normal	Exceptionally high	Exceptionally high
Cam	175	Above Normal	Notably high	Exceptionally high	Exceptionally high
Central Area Fenland	160	Above Normal	Above normal	Exceptionally high	Exceptionally high
East Suffolk	148	Above Normal	Above normal	Notably high	Exceptionally high
Little Ouse And Lark	149	Above Normal	Above normal	Exceptionally high	Exceptionally high
Lower Bedford Ouse	168	Above Normal	Above normal	Exceptionally high	Exceptionally high
North Essex	161	Above Normal	Above normal	Exceptionally high	Exceptionally high
North Norfolk	162	Above Normal	Above normal	Exceptionally high	Exceptionally high
Nw Norfolk And Wissey	156	Above Normal	Above normal	Exceptionally high	Exceptionally high

South Essex	122	Normal	Normal	Notably high	Notably high
Upper Bedford Ouse	156	Above Normal	Above normal	Exceptionally high	Exceptionally high

9.2 River flows table

Site name	River	Catchment	Jul 2024 band	Jun 2024 band
Abbey Heath	Little Ouse	Little Ouse	Notably high	Notably high
Blunham	Ivel	Ivel	Notably high	Above normal
Bramford	Gipping	Gipping	Notably high	Notably high
Burnham Overy	Burn	Burn	Exceptionally high	Notably high
Burnt Mill	Rhee	Rhee	Exceptionally high	Notably high
Cappenham	Tove	Tove	Notably high	Normal
Colney	Yare	Yare	Above normal	Notably high
Denver	Ely Ouse	Cutoff and Renew Channel	Notably high	Above normal
Dernford	Cam	Cam	Notably high	Above normal
Heacham	Heacham	Heacham	Notably high	Notably high
Ingworth	Bure	Bure	Exceptionally high	Notably high
Lexden	Colne	Colne Essex	Notably high	Above normal
Marham	Nar	Nar	Exceptionally high	Notably high

Needham Weir Total	Waveney (lower)	Waveney	Above normal	Above normal
Northwold Total	Wissey	Wissey	Notably high	Exceptionally high
Offord (gross Flows)	Great Ouse	Ouse Beds	Notably high	Normal
Roxton	Great Ouse	Ivel	Notably high	Normal
Springfield	Chelmer	Chelmer Upper	Exceptionally high	Above normal
Swanton Morley Total	Wensum	Wensum	Notably high	Notably high
Temple	Lark	Lark	Notably high	Notably high
Willen	Ouzel	Ouzel	Notably high	Normal

9.3 Groundwater table

Site name	Aquifer	End of Jul 2024 band	End of Jun 2024 band
Biggleswade	Ivel Woburn Sands	Notably high	Notably high
Bircham Newton	North West Norfolk Chalk	Notably high	Notably high
Breckland	Wissey Chalk	Exceptionally high	Exceptionally high
Bury St Edmunds	Upper Lark Chalk	Exceptionally high	Notably high
Castle Farm, Offton	East Suffolk Chalk	Exceptionally high	
Gog Magog, Stapleford	Cam Chalk	Exceptionally high	Exceptionally high
Hazlewood Common	East Suffolk Crag		Exceptionally high
Hindolveston	Norfolk Chalk		Notably high
Kenninghall	Little Ouse Chalk	Exceptionally high	Exceptionally high
Linton	Cam Chalk	Notably high	Notably high
Newmarket	Snail Chalk	Notably high	Notably high

Old Primary School, South Creake	North Norfolk Chalk		
Redlands Hall, Ickleton	Cam Chalk	Above normal	Notably high
Rook Hall, Braiseworth	East Suffolk Chalk		Above normal
Smeetham Hall Cottages, Bulmer	North Essex Chalk	Notably high	Exceptionally high
The Spinney, Costessey	Wensum Chalk		Notably high
Washpit Farm, Rougham	North West Norfolk Chalk	Notably high	Notably high
Therfield Rectory	Upper Lee Chalk	Exceptionally high	Exceptionally high
Fringford P.s.	Upper Bedford Ouse Oolitic Limestone (great)	Notably high	Above normal

9.4 Ensemble projections tables

9.4.1 Probabilistic ensemble projection of river flows at key sites in September 2024

Percentage of pie chart for each band

Site	Bedford Ouse	Kym	Ivel	Ouse	Ely Ouse
Exceptionally low	0	0	0	0	0
Notably low	0	0	0	0	0
Below normal	0	0	0	0	9
Normal	27	48	0	10	52
Above normal	26	23	10	35	2
Notably high	40	23	42	35	20
Exceptionally high	6	6	48	19	16

9.4.2 Probabilistic ensemble projection of river flows at key sites in December 2024

Percentage of pie chart for each band

Site	Bedford Ouse	Kym	Ivel	Ouse	Ely Ouse
Exceptionally low	0	2	0	0	0
Notably low	11	21	2	11	7
Below normal	15	11	11	15	11
Normal	35	34	29	34	30
Above normal	23	15	26	23	20
Notably high	3	3	8	2	11
Exceptionally high	13	15	24	16	20

9.4.3 Probabilistic ensemble projection of groundwater levels at key sites in December 2024

Percentage of pie chart for each band

Site	Therfield Rectory	Redlands Hall	Newmarket	Washpit Farm	Bircham Newton	Kenninghall	Bury St Edmunds	Smeetham
Exceptionally low	0.0	0.0	0.0	0.0	0.0	N/A	0.0	0.0
Notably low	0.0	0.0	0.0	0.0	0.0	N/A	0.0	0.0
Below normal	0.0	0.0	0.0	87.5	0.0	N/A	0.0	0.0
Normal	0.0	0.0	2.6	12.5	0.0	N/A	0.0	0.0
Above normal	0.0	98.3	87.2	0.0	11.1	N/A	33.3	0.0
Notably high	0.0	1.7	7.7	0.0	88.9	N/A	59.0	74.1
Exceptionally high	100.0	0.0	2.6	0.0	0.0	N/A	7.7	25.9

9.4.4 Probabilistic ensemble projection of groundwater levels at key sites in March 2025

Percentage of pie chart for each band

Site	Therfield Rectory	Redlands Hall	Newmarket	Washpit Farm	Bircham Newton	Kenninghall	Bury St Edmunds	Smeetham
Exceptionally low	0.0	0.0	0.0	0.0	0.0	N/A	0.0	0.0
Notably low	0.0	0.0	2.4	12.5	0.0	N/A	2.6	1.7
Below normal	0.0	15.3	23.8	12.5	14.8	N/A	23.1	10.3
Normal	14.8	42.4	28.6	59.4	29.6	N/A	35.9	19.0
Above normal	16.4	25.4	9.5	3.1	14.8	N/A	12.8	19.0
Notably high	50.8	5.1	16.7	9.4	14.8	N/A	5.1	27.6
Exceptionally high	18.0	11.9	19.0	3.1	25.9	N/A	20.5	22.4