Monthly water situation report

Yorkshire Area

Summary – July 2022

The fifth month in a row of below average monthly rainfall totals despite rain falling over the last ten days of the month. Low flow conditions dominated, with varied river response when the rain arrived. Soil moisture deficit remained high with the majority of Yorkshire classed as dry or very dry. Groundwater levels continued to fall, and reservoir stocks decreased week on week.

Rainfall

Using the Met Office HadUK-grid data, July recorded the fifth month in a row of below long term average (LTA) rainfall. Catchment averaged rainfall was classed as normal in the Swale, Ure, and Nidd with 87%, 88%, and 84% of the LTA respectively. While the Don and Hull and Humber were notably low with 49% of the LTA, the remainder of the catchments were classed as below normal, ranging from 59% to 80% of the LTA.

The unsettled weather at the end of June continued on the 1st July, producing a wet day over Yorkshire. The upper reaches of the Ure, Nidd, Wharfe, Aire, and Calder were particularly wet. Conditions changed on the 2nd July. Very little rain fell during the following twenty days which contained numerous rain free days and high temperatures. Between 1% and 26% of the monthly total rainfall fell over the 2nd to 21st July.

The last ten days of July experienced unsettled, wetter conditions producing 65% to 90% of the total monthly rainfall during this period. Higher rainfall totals occurred in the upper catchments of North and West Yorkshire around the Pennine Ridge, with lower rainfall totals in South Yorkshire and to the east over the Esk, Derwent, and Hull and Humber catchments.

The Met Office HadUK-grid data from 1891 is showing that it was the 5th driest four-month period ending in July for Yorkshire. For the individual catchments, the four-month period ending in July was the 4th driest for the Hull and Humber and 5th driest for the Calder. It was also the 5th driest five-month period ending in July for the Calder.

Soil Moisture Deficit

The start of July experienced normal soil conditions across the western Pennine slopes, and dry or very dry soils over the rest of Yorkshire. The eastern Derwent and Hull and Humber catchments had the driest soils. An increase in soil moisture deficit (SMD) during the first week led the Derwent and Hull and Humber catchments to reach their maximum deficit and remain at this level through the month. SMD for the rest of Yorkshire increased, maintaining very dry conditions over most of the Area until the final week. The rainfall during the last ten days of the month produced a small reduction in deficit across North and West Yorkshire. South Yorkshire showed no change after the first week, containing high SMD throughout. The monthly SMD levels showed the soils in the eastern catchments were classed as being very dry, the north-western Pennine Ridge was normal, and the rest of Yorkshire was dry.

River Flows

In general terms, river flows declined throughout the month until the arrival of the rain during the final ten days. However, the amount of rain varied across the Area which produced differing river responses. For the month as a whole below normal, or lower, monthly mean flows were widespread in the Pennine-fed catchments of North, West, and South Yorkshire. The Ure, lower Nidd, Wharfe, and Aire were classed as below normal with 32% to 61% of the monthly LTA. The Don and Went were classed as notably low with 53% and 54% of the LTA respectively. The monthly mean flows for the remaining catchments were classed as exceptionally low with 27% to 51% of the LTA.

On the River Swale, decreasing flow led to exceptionally low flow conditions for the time of year from the 6th until the 23rd July. The rainfall at the end of the month caused flow to steadily increase, just reaching normal flow conditions on the last day of the month.

Decreasing flow on the River Ure quickly changed from normal conditions at the beginning of the month into exceptionally low conditions by the 11th. Flow remained exceptionally low until the 22nd before increasing into the normal flow range from the 25th then above normal on the 31st.

Below normal flow conditions occurred on the River Nidd between the 9th to 27th July. The last six days experienced a slight rise in flow into the normal range expected for the time of year.

Very low flow conditions dominated on the River Ouse. Notably low flow declined into exceptionally low flow on the 9th and remained in the exceptionally low flow range until the 21st. Rising flow occurred during the last six days, with the final day experiencing flow in the normal range expected.

Below normal flow conditions occurred on the River Wharfe between the 9th to 24th July. The last six days experienced rising flow through the normal range with the last day of the month reaching notably high conditions.

Below normal flow on the River Aire began on the 4th July, falling into notably low on the 11th and reached exceptionally low on the 20th. Rising flow during the final ten days ensured a daily mean flow of above normal on the 31st.

Notably low flow on the 3rd July fell into exceptionally low flow on the 12th on the River Calder. Flow remained very low until the 23rd before steadily rising through the below normal range, reaching normal conditions on the 31st.

Decreasing flow on the River Don quickly changed from above normal conditions at the beginning of the month to exceptionally low conditions by the 7th. Flow remained exceptionally low until the 21st before fluctuating between below normal and notably low. The last two days experienced flow in the normal range expected for the time of year. The River Rother on the other hand experienced very low flow through July, remaining exceptionally low for virtually all the month.

The River Went, with a higher groundwater input, fluctuated between below normal and notably low flow until the 24th July. A steady rise at the end of the month in response to the rain saw normal flow conditions return.

Below normal, or lower, monthly mean flow also occurred in the eastern catchments of the Derwent, Rye, Hull and Humber, and Esk. The upper Hull was classed as below normal at 61% of the LTA, the Esk as notably low at 33% of the LTA, and the Derwent and Rye as exceptionally low at 46% and 41% of the LTA respectively.

On the River Derwent and its tributary, the Rye, very low flow occurred throughout the month. Exceptionally low flow on the River Derwent occurred over the 5th to 22nd before fluctuating between notably low and below normal flow until the end of the month. The River Rye experienced exceptionally low flow for virtually all month, just rising into below normal on the 31st July. The River Esk in the north-east of the area generally experienced below normal or notably low flow. With the last eight days being below normal or normal in response to some rainfall in the catchment.

On the chalk-fed West Beck in the upper Hull catchment, flow steadily decreased through the month, remaining in the below normal range over the 6th to 30th July. A minor increase in flow on the last day of the month produced a daily mean flow just rising back into the normal range expected for the time of year.

Groundwater Levels

Magnesian Limestone

The groundwater level continued to fall within the Magnesian Limestone at Brick House Farm although remained at above normal for the time of year.

Millstone Grit

The groundwater level fell within the Millstone Grit at Hill Top Farm and was normal for the time of year. It should be noted that this observation borehole is used for abstraction. Therefore, the groundwater level record will be directly affected by pumping.

Sherwood Sandstone
The groundwater level continued to fall within the Sherwood Sandstone at Great Ouseburn and was at normal for the time of year. At Riccall Approach, the groundwater level continued to fall sharply and was below normal for the time of year.

Corallian Limestone
The groundwater level continued its steady decline within the Corallian Limestone at Sproxton and remained at normal for the time of year.

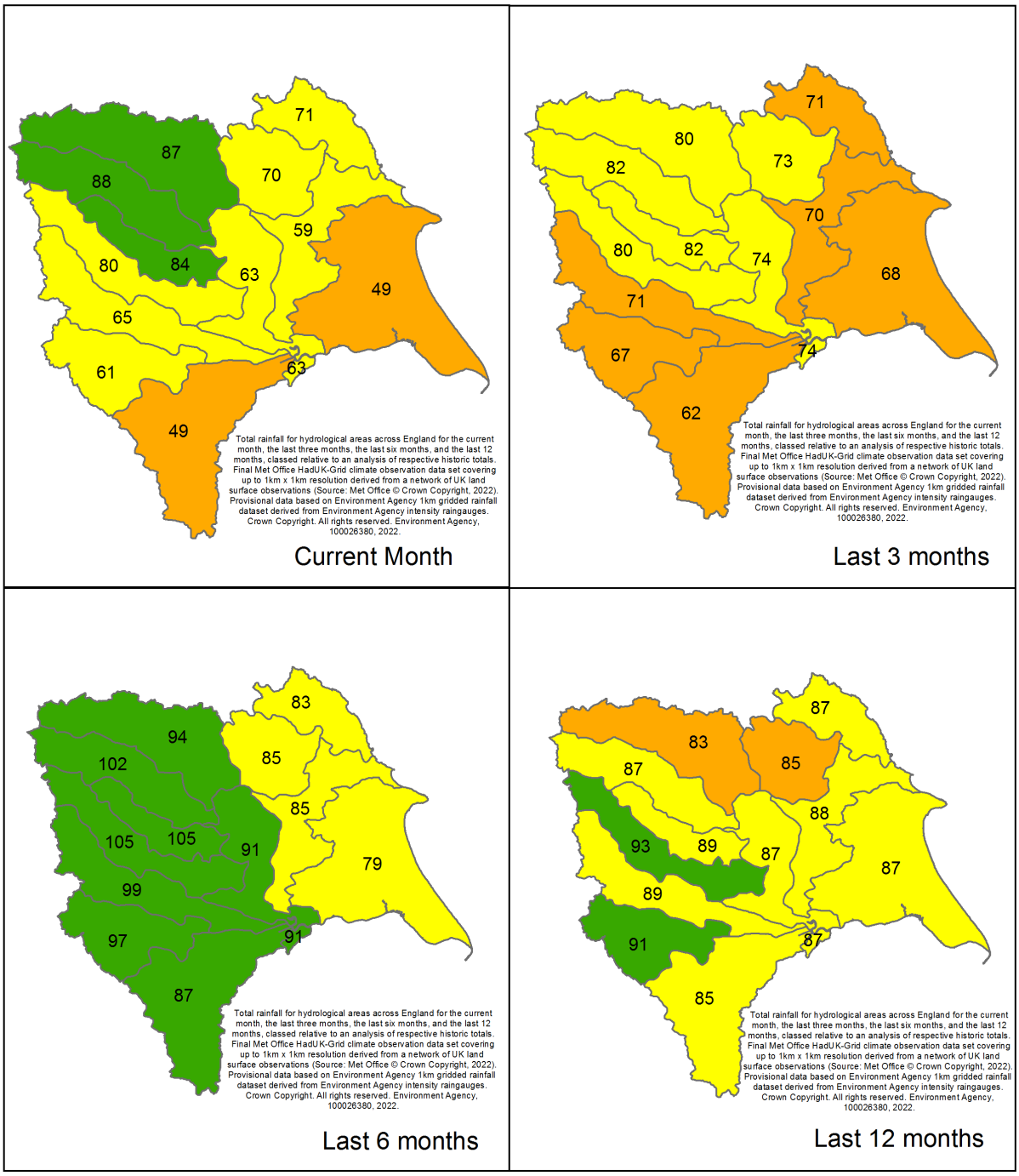
Chalk
The groundwater level continued to fall at Wetwang (northern Yorkshire Wolds chalk) and was at notably low for the time of year. The groundwater level also continued to fall at Dalton Estate (central Yorkshire Wolds chalk) and remained at below normal for the time of year.

Reservoir Storage
The total reservoir stocks declined at an average of 3% to 4% per week during the first three weeks. The rain during the end of the month had some, although little, overall impact as stocks still declined but at a slower rate of 2%. By the end of the month, they had fallen to 23% below the LTA for the time of year.

Environmental Impact
By the end of July, 68 hands-off flows were in force, with the majority located in the Derwent catchment. 112 further abstractors had been warned that flows were low but were still able to abstract. The majority of these were in the Swale, Ouse, and Derwent catchments.

Author: Yorkshire Hydrology

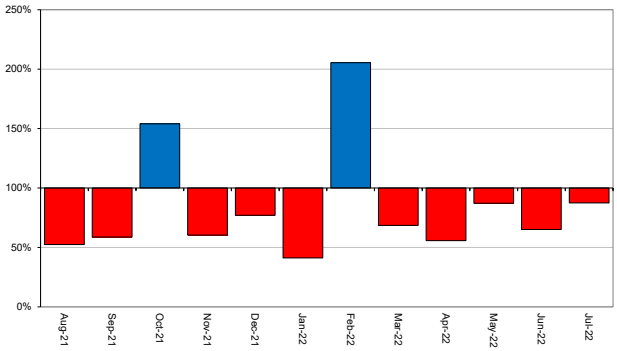
Rainfall



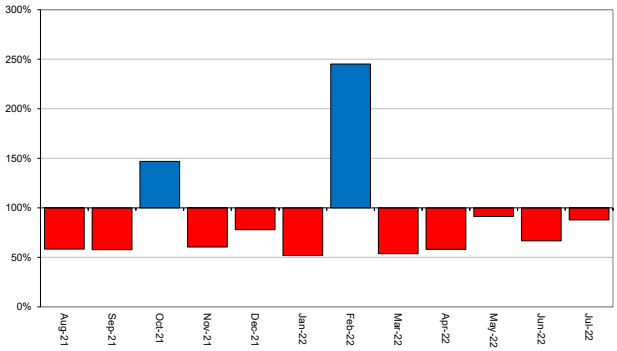
Above average rainfall

Below average rainfall

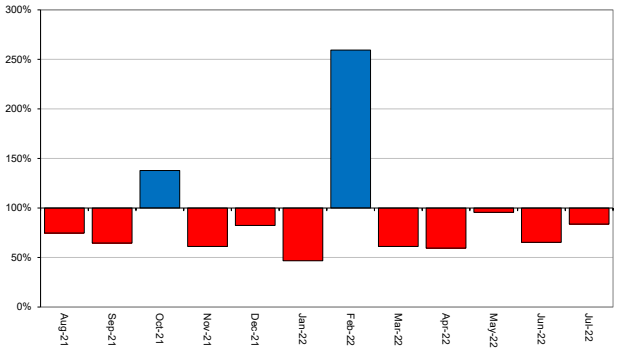
1-Month Period for Swale (NE)



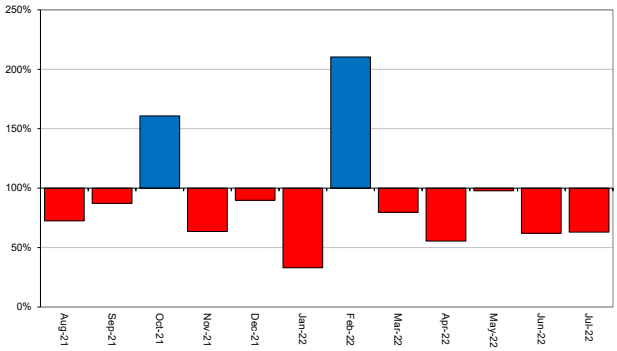
1-Month Period for Ure



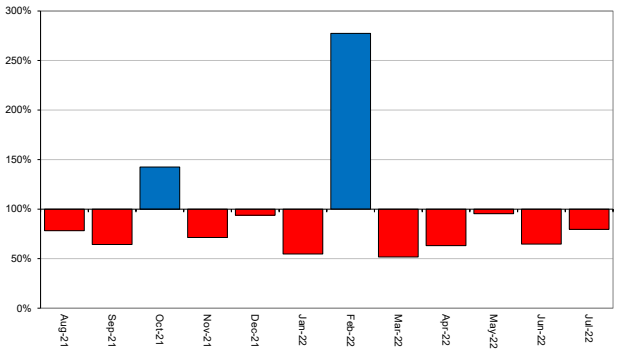
1-Month Period for Nidd



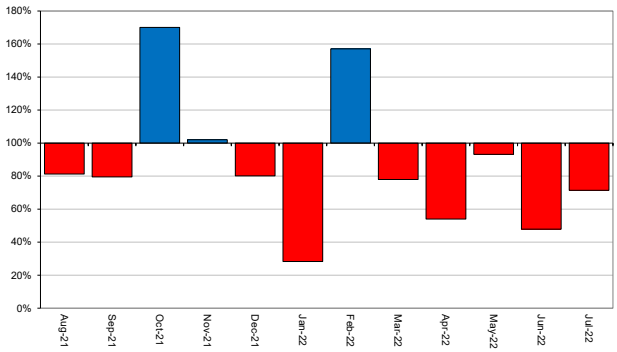
1-Month Period for Ouse



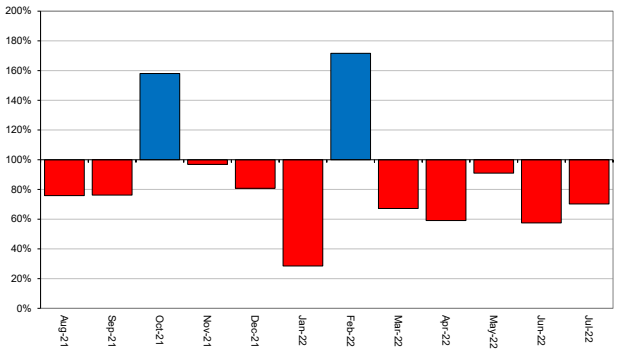
1-Month Period for Wharfe



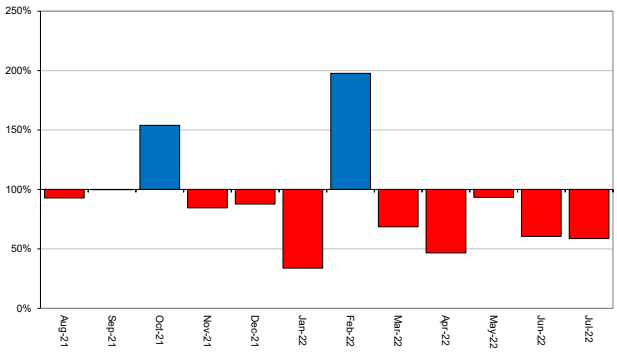
1-Month Period for Dales North Sea Tribs



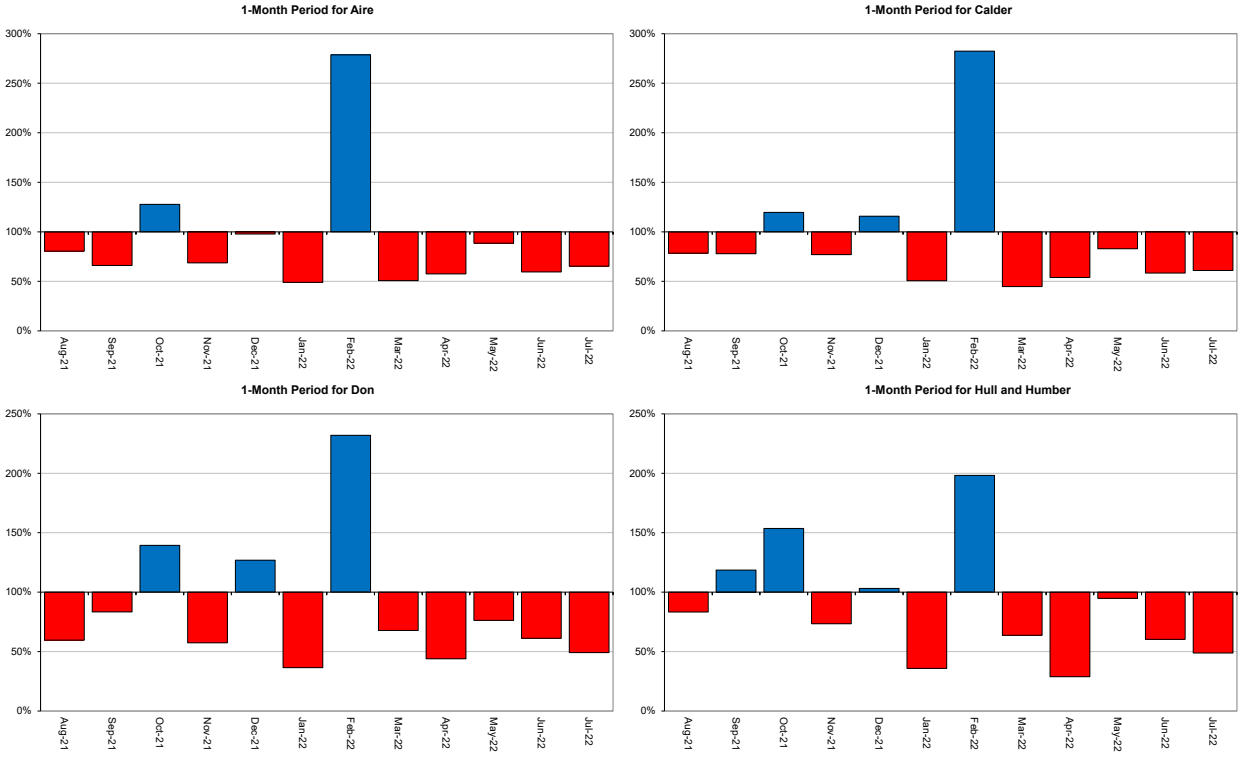
1-Month Period for Rye



1-Month Period for Derwent (NE)



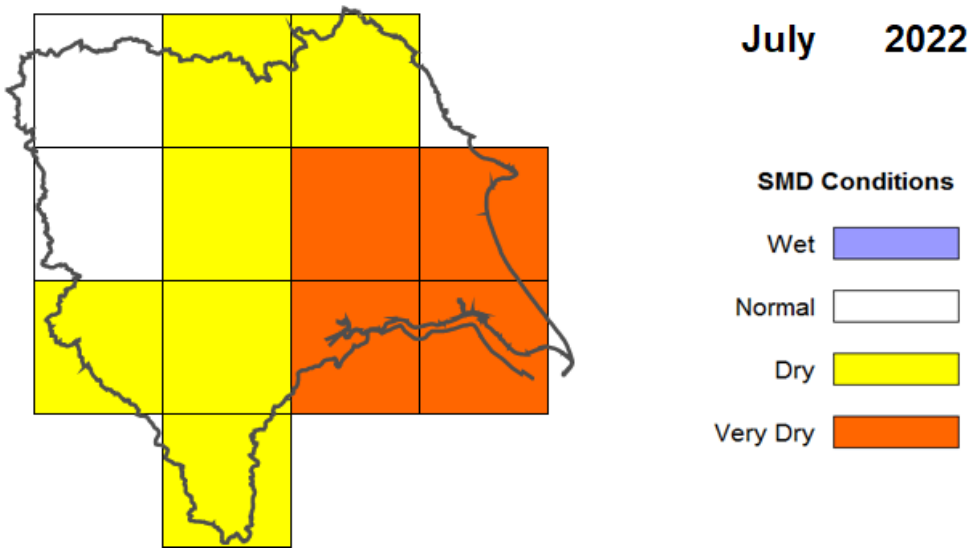
Above average rainfall Below average rainfall



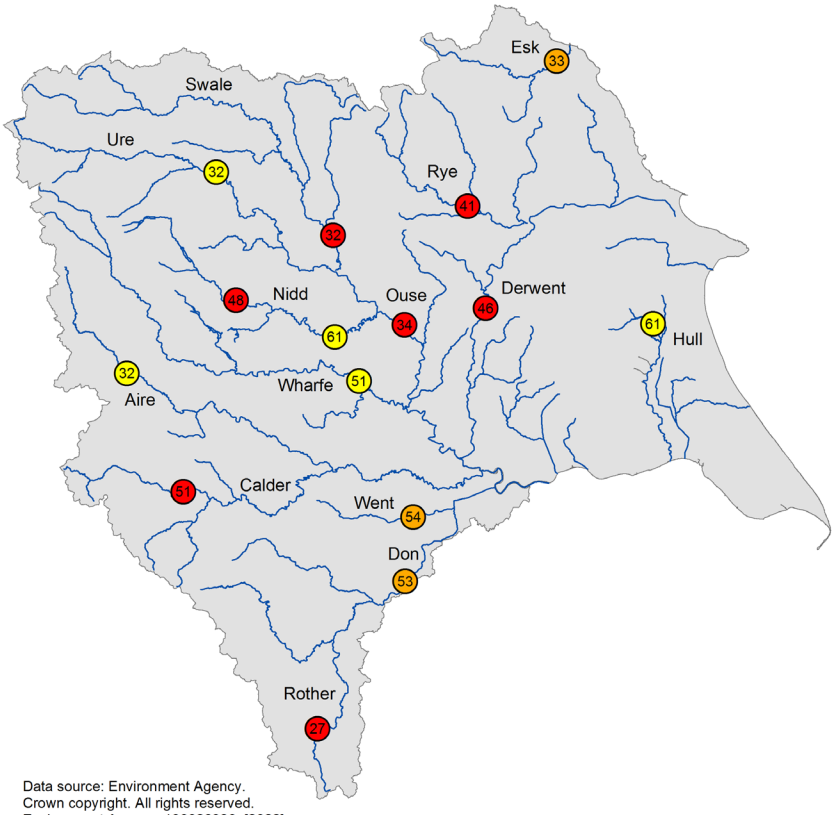
Soil Moisture Deficit

Environment Agency - Yorkshire Area

Monthly MORECS SMD Levels



River Flow



Data source: Environment Agency.
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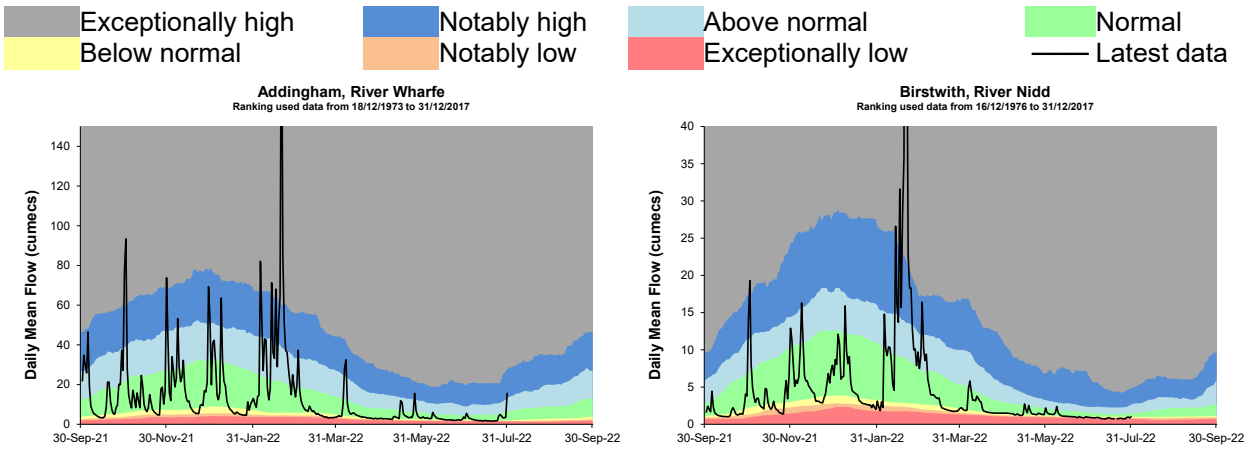
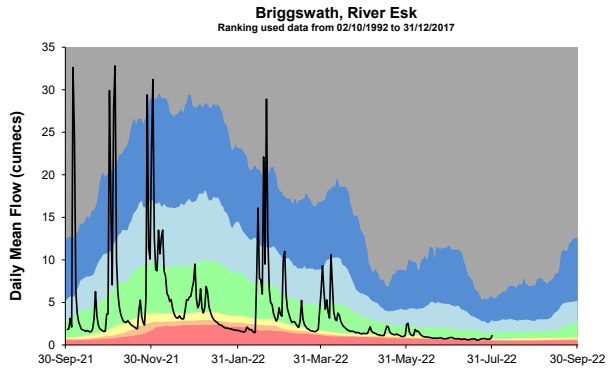
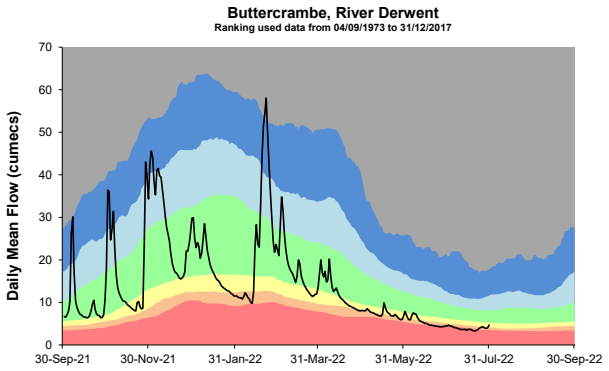
Environment Agency. 100026380. [2022].

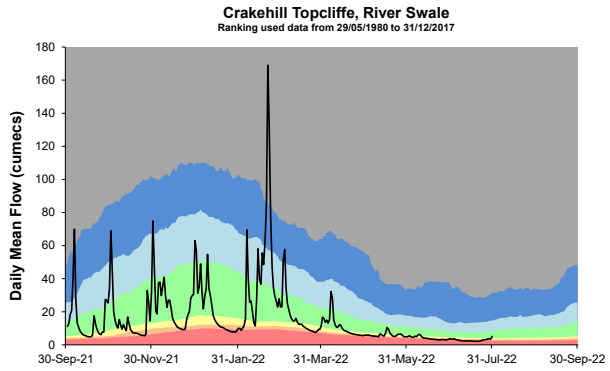
River flow site
Class

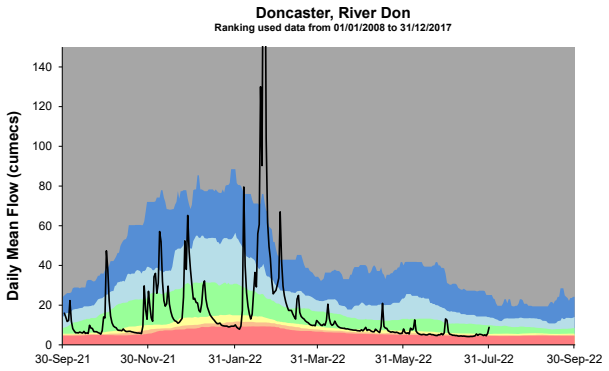
- Exceptionally high
- Notably high
- Above normal
- Normal
- Below normal
- Notably low
- Exceptionally low
- Dry
- No data
- (5) % of long term average
- Main river network

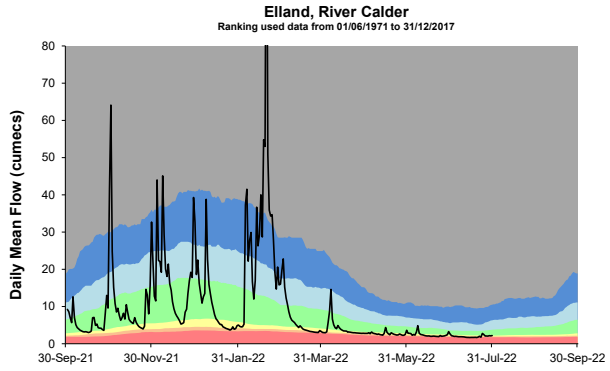


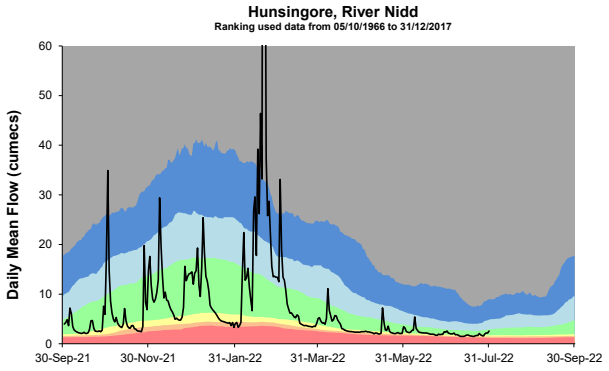


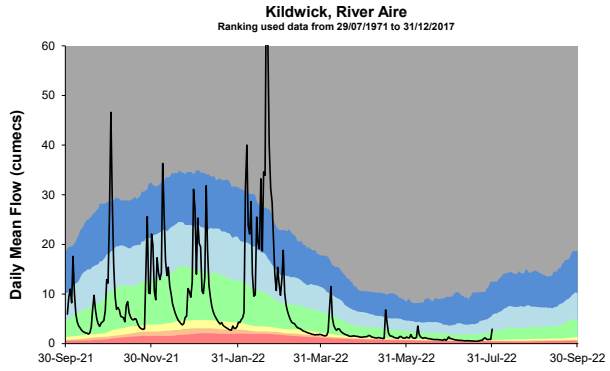


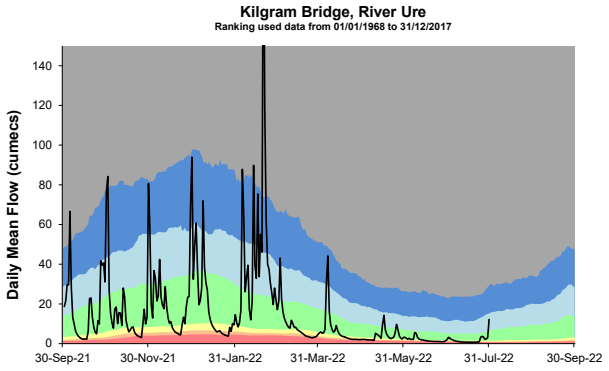


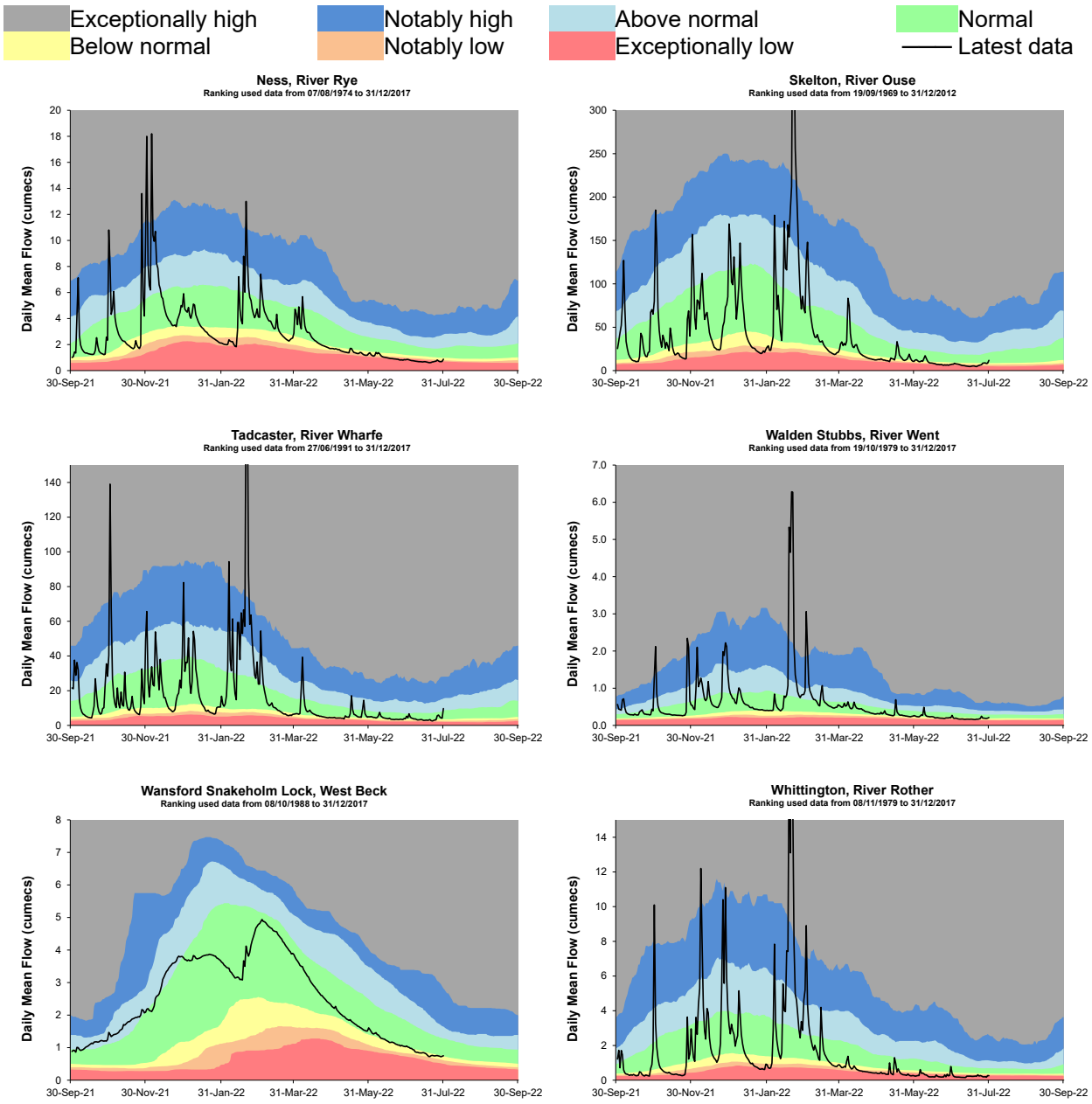




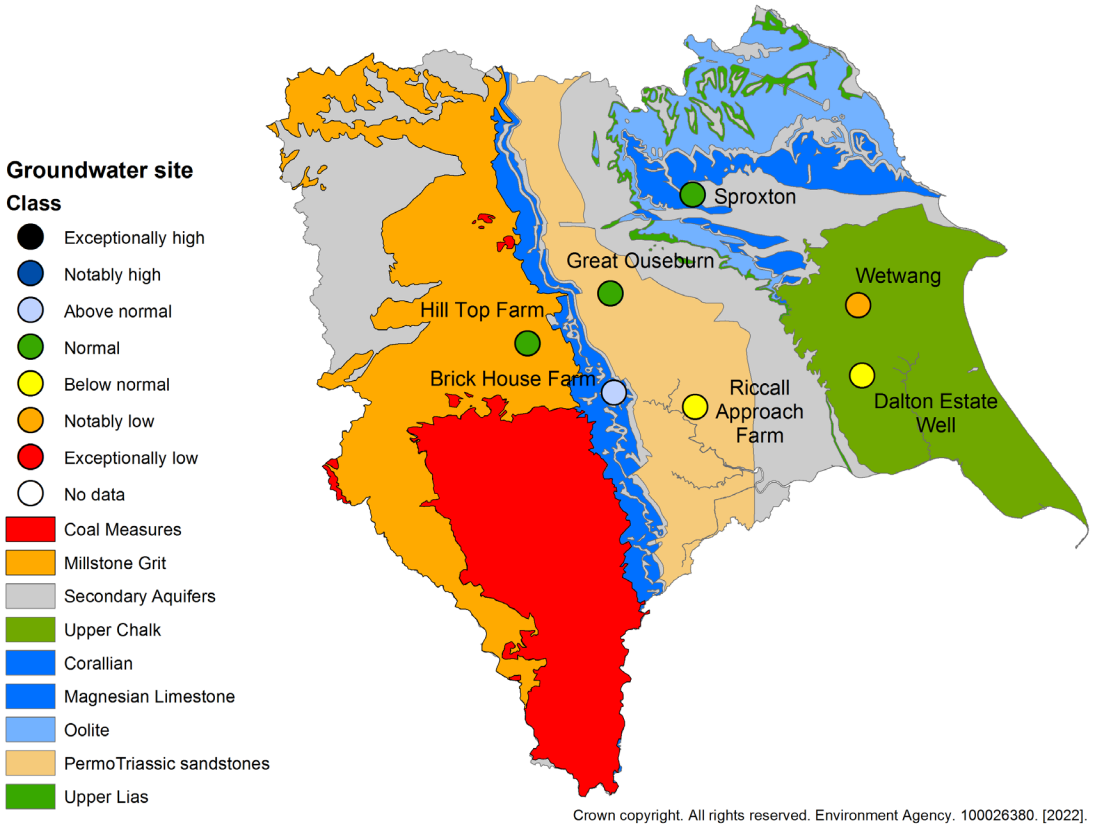


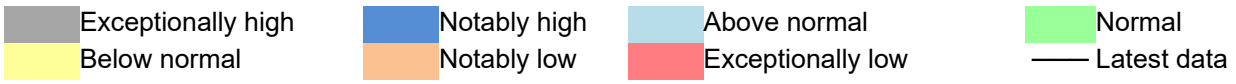




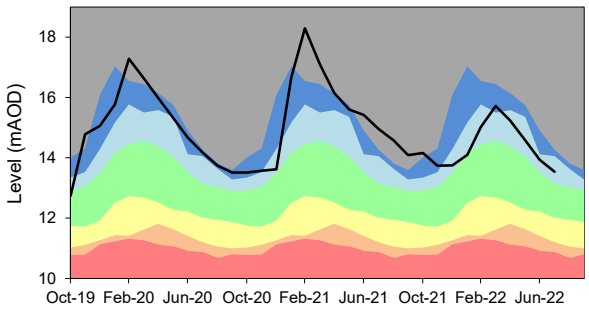


Groundwater Levels



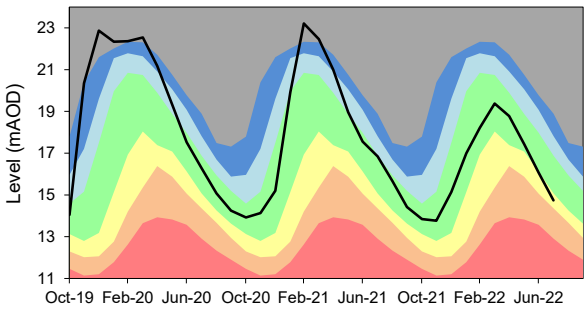


Brick House Fm
Ranking derived from data for the period Oct-1979 to Nov-2017

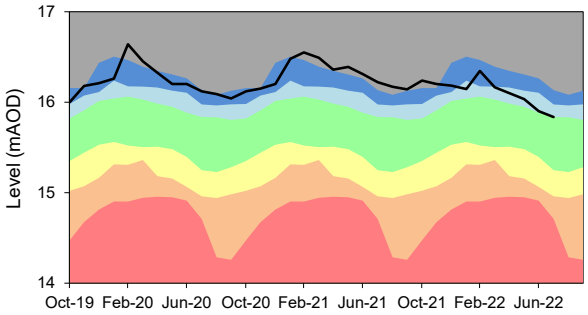


End of month ranking extrapolated from period of record single mid-month dip readings

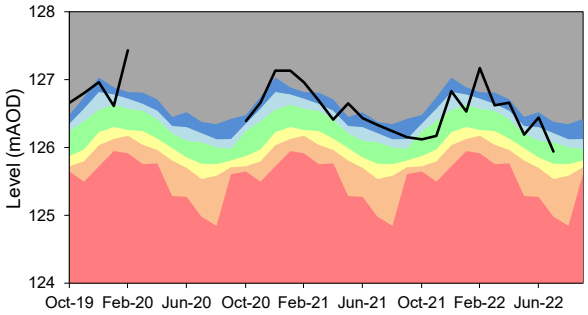
Dalton Estate Well
Ranking derived from data for the period Jan-1889 to Nov-2017



Great Ouseburn
Ranking derived from data for the period Jan-1976 to Nov-2017

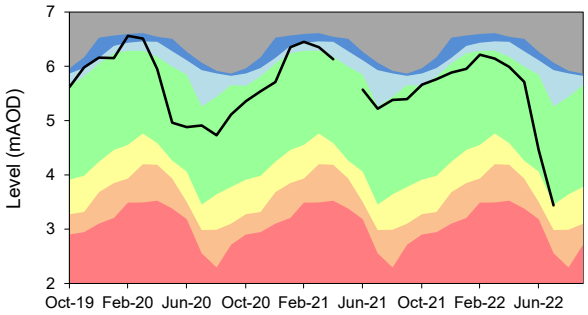


Hill Top Fm
Ranking derived from data for the period Oct-1973 to Nov-2017

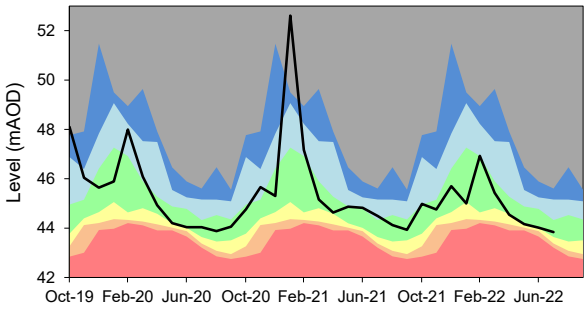


End of month ranking extrapolated from period of record single mid-month dip readings

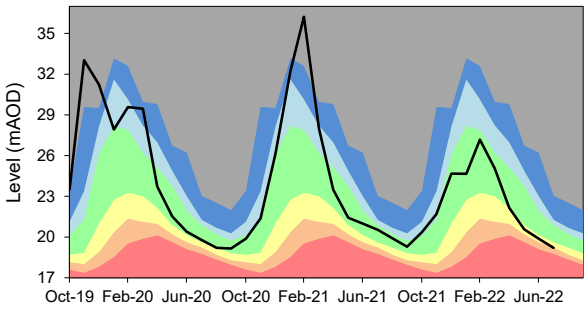
Riccall Approach Farm
Ranking derived from data for the period Feb-1977 to Nov-2017



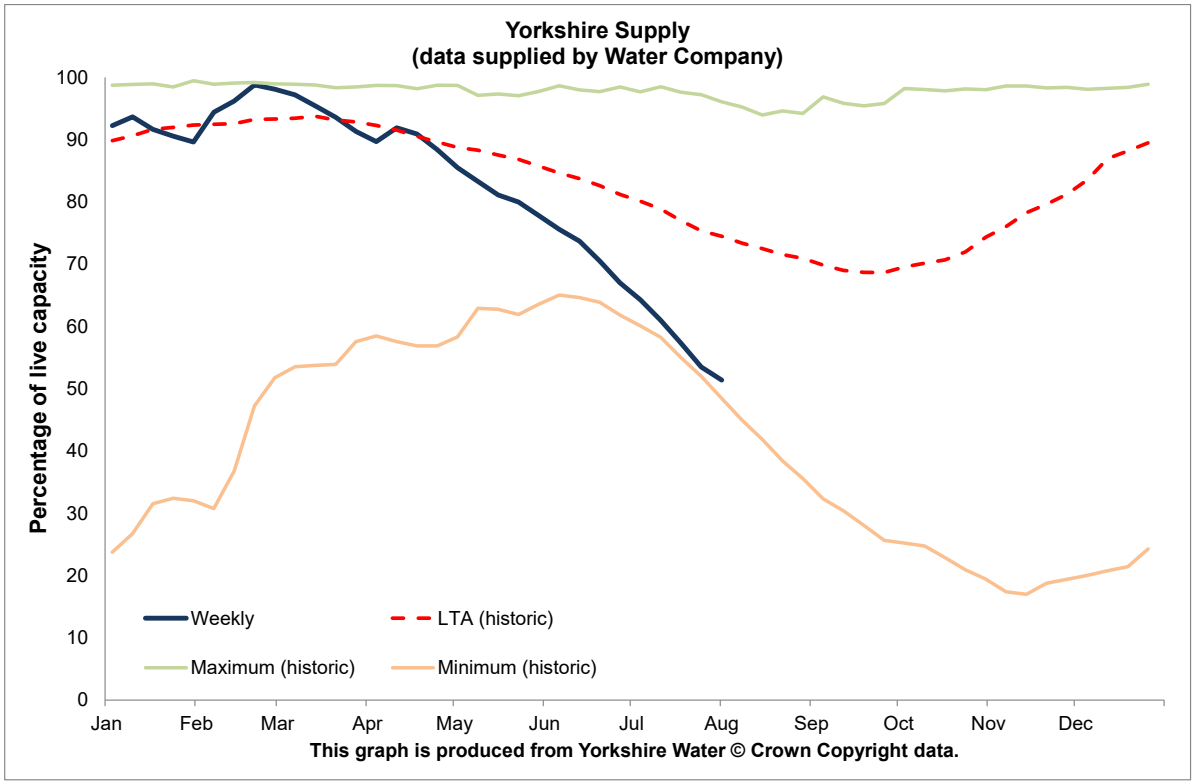
Sproxton
Ranking derived from data for the period May-1975 to Nov-2017



Wetwang
Ranking derived from data for the period Oct-1971 to Nov-2017



Reservoir Stocks – Data from Water Company



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, usually based on the period 1961-1990. 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 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