

Soil moisture on 31 December 2023 (see back page for explanatory comments).

Notes on period to 01 January 2024

At the end of December, soil moisture was above field capacity for much of the COSMOS-UK network.

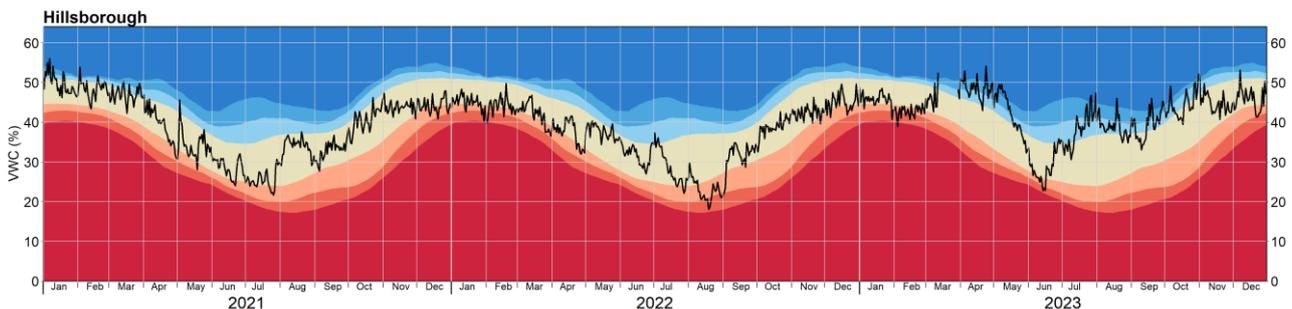
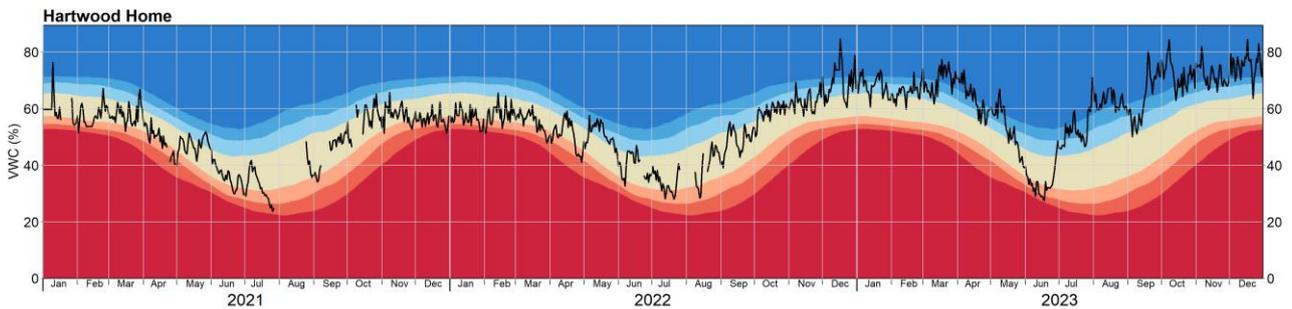
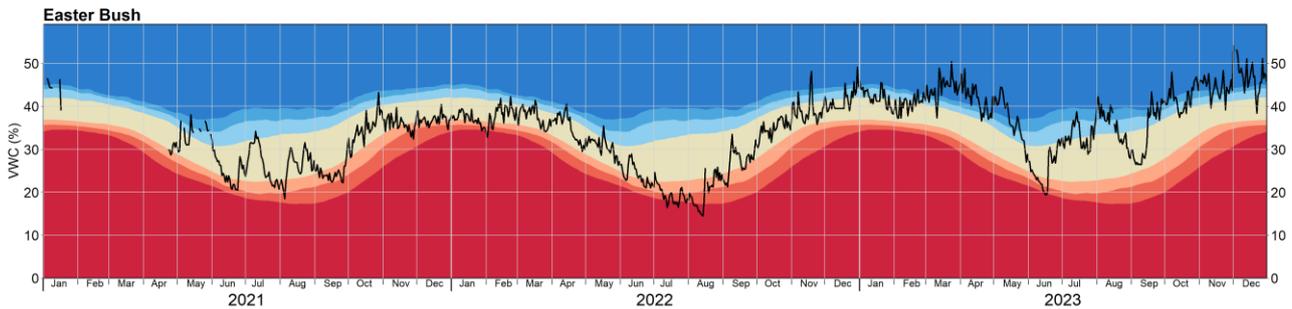
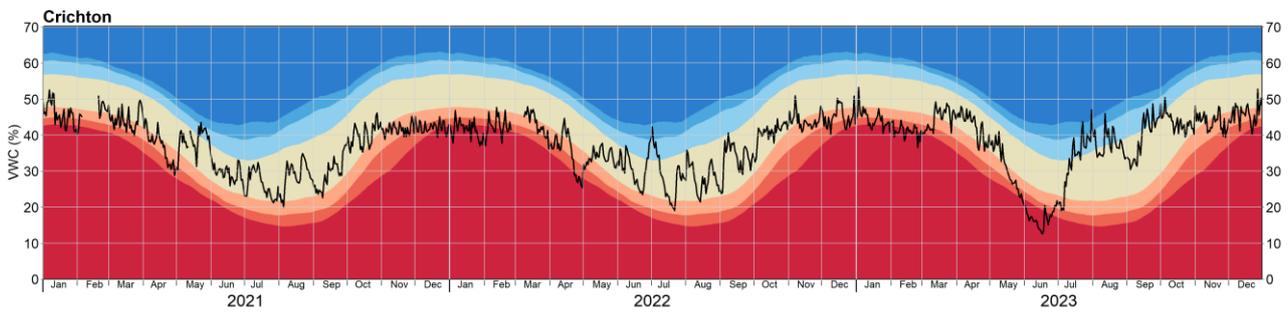
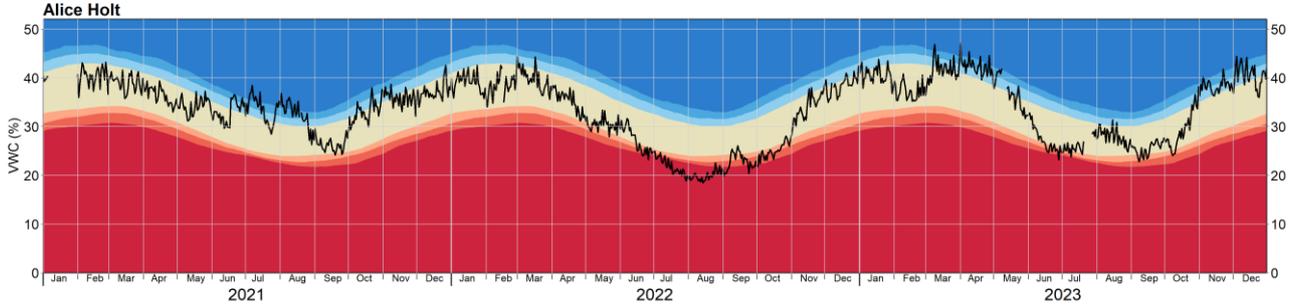
Provisional Met Office data indicate precipitation was above long-term averages for most of the UK in December. Similar storms to those seen in October and November brought frequent rain and strong winds to many UK regions. Central England and Eastern Scotland received roughly twice the usual precipitation in December. However, conditions remained mild for most of the month, particularly in England and Wales, where temperatures were about 2 degrees higher than long-term averages.

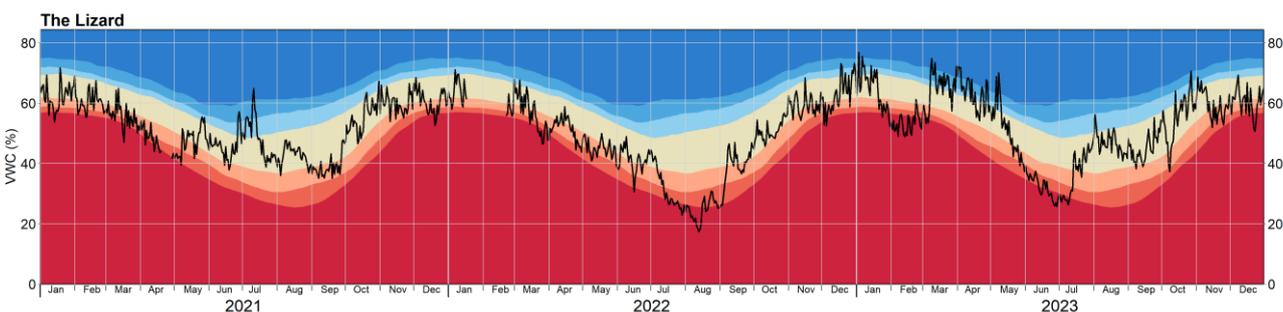
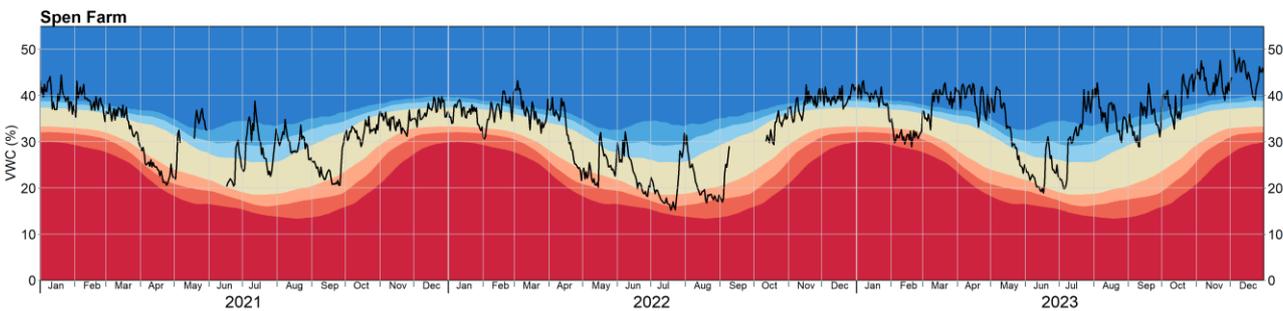
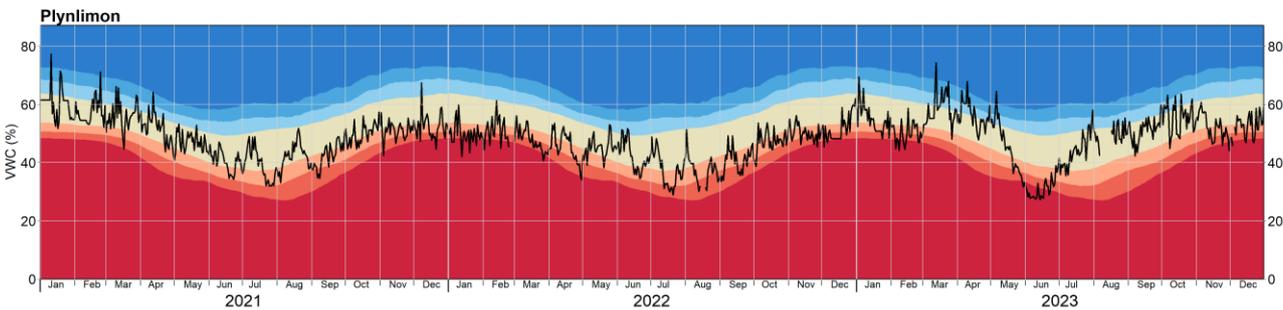
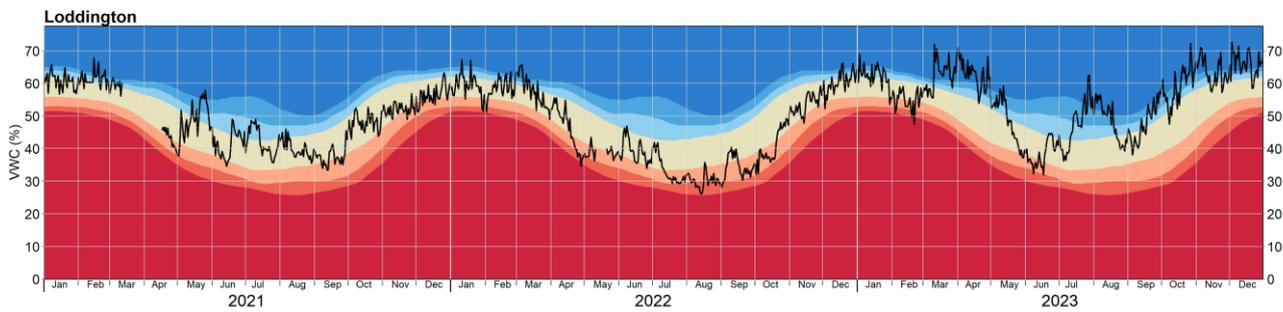
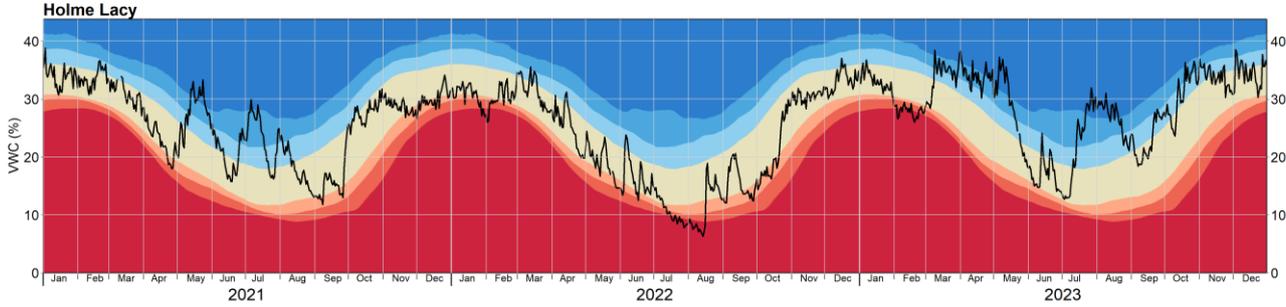
At the end of the month, soil moisture was above field capacity for most COSMOS-UK sites. Easter Bush, Hartwood Home, and Spennymuir remained very wet, whereas other sites, such as Crichton, Hillsborough, and Plynlimon, were within the normal range for this time of year. Several sites had standing water on the surface, and this will be interpreted as 'soil moisture' by the integrated large area Cosmic-ray neutron sensing technique, hence soil wetness reported can be well above saturation values for those sites.

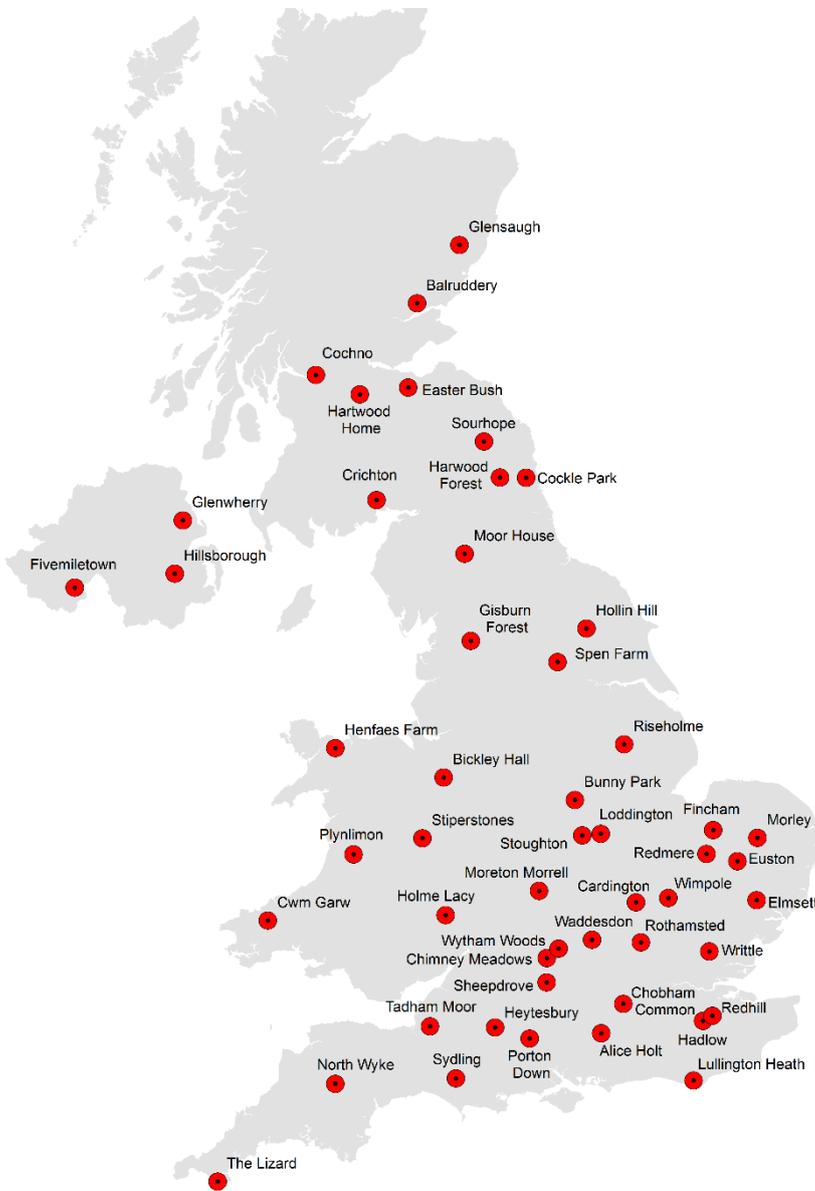
Overall, soil moisture is above field capacity for much of the COSMOS-UK network, given that December was such a wet month.

Network news

COSMOS-UK has now recorded data across a full solar cycle for some sites. This data allows the team to review our neutron intensity correction, which is expected to improve the accuracy of VWC estimates. Initial results have been encouraging for sites such as Glenwherry and Gisburn. This improvement will be implemented through January, and future estimates will better compensate for changes in the solar cycle.







About the maps on page 1: The maps show daily mean soil moisture on the last day of the month. Colours indicate wetness as in the legends.

The map on the left shows wetness as the volumetric water content (VWC) of the soil which is constrained by soil type, i.e. some soils are able to hold more water than others as indicated by the shape of the symbol.

The map on the right presents soil wetness adjusted for site specific characteristics, i.e. taking account of the possible range of soil wetness at each site. Field capacity (FC) is a key point in this range. When soil moisture is below FC soil moisture is said to be in deficit, i.e. there is a (positive) soil moisture deficit (SMD).

Grey shaded areas on these two maps represent principal aquifers.

About the graphs on pages 2 and 3: The black line shows VWC. The coloured bands indicate how VWC compares to historical variability for the site and time of year.

- exceptionally dry
- notably dry
- drier than normal
- normal
- wetter than normal
- notably wet
- exceptionally wet

About soil moisture: Soil moisture varies in the short term (hours to days) with rainfall and as water drains through the soil. Longer term variation is driven by the seasonal difference between rainfall and evaporation. Thus soil moisture decreases in the summer when evaporation exceeds rainfall but increases when this is reversed. In most winters under UK conditions, soil moisture reaches a relatively constant value, known as the field capacity. Field capacity is a measure of how much water the soil can hold against gravity and is strongly dependent on the soil type. Soils are expected to be around field capacity after being wetted to above field capacity and the excess water (e.g. from macropores) has drained away under gravity, which can take several days after heavy rain, to reach a near steady state. Differences in soil type and weather patterns cause variations in soil moisture between sites including when the soil returns to field capacity in autumn/winter and when soil moisture decreases in the spring/summer.

About COSMOS-UK: COSMOS-UK is supported by the Natural Environment Research Council award number NE/R016429/1 as part of the UK-SCAPE programme delivering National Capability.

