

APPENDIX D

CHALK EAST landscape and geodiversity in the

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Chalk landscape, landforms and soils

The Chalk is the 'backbone' of the physical landscape in the East of England. It forms a 'chalk belt' which crosses the region, including the northern Chiltern hills and their north-eastwards extension as the East Anglian Heights, and continuing through West Suffolk into Breckland and West Norfolk. It forms some of the most beautiful and inspiring landscapes in the region

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Winter fields at Heydon, Cambs.

The North Chilterns

The chalk hills of the Chilterns are designated as an Area of Outstanding Natural Beauty, and form the highest ground in the region (up to 244m (802ft) near Tring). Physical features include:

- a prominent escarpment with steps and platforms (as seen at Dunstable, Totternhoe, Sundon, Sharpenhoe, Hexton);
- major valleys with chalk rivers draining south-eastwards (such as the Bulbourne, Gade and Ver);
- a plateau capped with deposits of clay-with-flints (the tops are often wooded);
- an extensive dip slope with many dry valleys;
- seasonal or intermittent streams, known as bournes.

This is an ancient landscape; the drainage pattern may have taken shape over a million years ago.



A view of the Chilterns chalk hills near Berkhamsted, Herts. Woodland has developed on the clay-with-flints which caps the higher ground.



Long Deans, a dry valley near Hemel Hempstead, Herts. Such features may have formed in periods of enhanced run-off, when groundwater levels were higher or ground was frozen in the Ice Age.



The Dunstable Downs, Beds. The Middle Chalk escarpment is fretted with dry valleys. It overlooks a 'bench' of softer chalk where Dunstable Downs gliding club aerodrome is situated.

For more information see the [Chilterns National Character Area](#) and [Chilterns Natural Area](#) profiles.

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The East Anglian Chalk

The chalk escarpment of the Chilterns continues north-eastwards through Cambridgeshire, Hertfordshire, Essex and Suffolk and becomes the East Anglian Heights. Its highest point is 147m (482ft) at Chrishall, Essex. Physical features include:

- a distinctive open, rolling landscape fronted by gentle, stepped escarpments (as seen at Ashwell, Therfield Heath, Heydon, Wandlebury);
- shallow dry valleys (as at Kelshall, Heydon);
- spring-lines where water emerges from the chalk aquifer at impermeable layers, such as the Melbourn Rock (as at Ashwell, Fowlmere, Fulbourn, Chippenham);
- an extensive dip slope mantled with glacial till and an extensive dip slope mantled with glacial till and dissected by valleys with streams which may cut down to chalk bedrock;
- seasonal streams (for example the River Kennett at Moulton).

The Anglian glaciation has played an important role in the shaping this landscape: its ice sheets eroded and surmounted the escarpment, draping it and the dip-slope with till ('boulder clay'), breaching it to form through-valleys such as the River Cam, and progressively lowering the escarpment towards the north-east.



The Upper Chalk escarpment near Barkway, Herts. The bare fields show darker bands of glacial till interspersed with slabs of chalk thrust up by an ice sheet.



A dry valley in the Middle Chalk at Therfield Heath, Herts. The chalk grassland on this site is thought to have been developing for 4,000 years since the Bronze Age.



Ashwell Springs, Herts, the source of the River Rhee. Water emerges from the chalk aquifer at the impermeable Chalk Marl horizon of the Lower Chalk.

For more information see the [East Anglian Chalk National Character Area](#) and [East Anglian Chalk Natural Area profiles](#).

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Breckland and West Norfolk

The 'chalk belt' continues through West Suffolk into Breckland and West Norfolk, although it is often disguised by Ice Age glacial deposits. 500,000 years ago there were probably chalk hills here as high as the Chilterns today, but 450,000 years ago the Anglian ice sheets flowed over them, eroded and covered them with till in many places. However the influence of the Chalk on the landscape can be seen in subtle ways. Physical features include:

- low, rolling uplands, often mantled by a veneer of glacial till (as seen at Swaffham, Great Massingham, Docking);
- periglacial patterned ground, where frost acting on varying chalky and sandy subsoils produced soil stripes and polygons (as at Brettenham Heath, Grimes Graves, Brancaster);
- chalk streams, where rivers are supplied by chalk springs or run directly over chalk bedrock (for example the rivers Nar, Wissey, Thet);
- Breckland meres, where the Chalk is an aquifer for a group of natural lakes in Breckland with a distinct seasonal recharge regime (as at Langmere, Ringmere, Fowlmere);
- periglacial pingo ponds and palsas, where frost acting on springs in the Chalk bedrock during the Ice Age has given rise to clusters of ramparted ponds (as at Thompson, Foulden and East Walton Commons);

- dolines, basin-shaped depressions caused by solution and collapse of the Chalk bedrock (the Devil's Punchbowl at Croxton is a good example).



Chalk is close to the surface at Tumbley Hill, West Acre. Aerial photos show remarkable periglacial patterned ground forming nets and stripes here



A relict pingo pond at East Walton Common. Earth ramparts surround a depression where a blister of ground ice once formed over a Chalk spring.



The Devil's Punchbowl, Croxton, is a doline with fluctuating water levels that vary according to the level of ground water in the underlying Chalk bedrock.

For more information see the [Breckland National Character Area](#) and [Breckland Natural Area](#) profiles; also the [North West Norfolk National Character Area](#) and [North Norfolk Natural Area](#) profiles.

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Other Chalk landscapes in the East of England

The Chalk influences landscapes and landforms in other parts of the region, where it lies close to the surface beneath younger strata and 'drift' deposits. For example:

- valleys may have cut down through younger deposits to expose chalk bedrock in the middle sections of their course, as in the Wensum and Gipping valleys;
- chalk springs may bubble up in valleys, as along the Glaven valley (Norfolk);
- solution hollows (dolines) may form where solution and collapse of the Chalk has taken place beneath thin superficial deposits; these may take the form of circular depressions in farmland;
- solution hollows close to valley sides may have become enlarged by thermokarst processes in the Ice Age to form natural lakes; examples include Quidenham Mere (Norfolk) and Bosmere (Suffolk);

- streams may be absorbed into swallow-holes where overlying deposits become thin, as at Water End (Herts), or where they flow off boulder clay, as at Coddenham (Suffolk).



Diss Mere, Norfolk, is a basin-shaped lake 18m (60ft) deep. It probably developed as a solution collapse feature in Chalk bedrock, and is fed by three powerful springs



Swallow-holes at Water End, Herts. Chalk underlies impermeable London Clay. Two streams converge on a series of sink-holes and disappear into the Chalk beneath.



The River Glaven at Hunworth, Norfolk. It is 17km long, of which 11km are classified as a chalk stream; it flows over chalk bedrock in its lower reaches.

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Soils in the Chalk landscape

Soils result from weathering and biological processes operating on the underlying geological parent material. In the 'chalk belt' the chalk bedrock has played a formative role, along with various superficial 'drift' deposits. It is typically free-draining, except where it has clay-rich horizons, or is covered with clayey 'drift'.

Soils in the 'chalk belt' include:

- rendzinas - shallow, silty, grey, well-drained soils; formed over chalk bedrock on escarpments and hillsides;
- calcareous brown earths - loamy, well-drained, chalk-rich soils; formed over chalky material on gently undulating land;
- palaeo-argillic brown earths - fine silty or loamy soils with flints and a reddened subsoil; formed over plateau drift, clay-with-flints or glacio-fluvial drift and till.

In the Breckland area, chalky sub-soils are covered with a sandy layer of glacio-fluvial and aeolian drift. Their interaction under periglacial conditions during the Ice Age has produced patterned ground of stripes and polygons in many places.



A grey rendzina soil over chalk at Therfield Heath, near Royston, Herts.



Brown sands with a grey podsol horizon over chalky drift at Brettenham Heath, Norfolk.



A brown calcareous earth soil over chalk at Warden Hill, near Luton, Beds.

Find out more about the region's soils by visiting the National Soil Resources Institute's [Soilscapes Viewer](#).

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