

## How we find the sites

Many of the archaeological sites mapped by aerial archaeologists have been levelled by ploughing and are identified from the photos as cropmarks or soilmarks.

Archaeological sites which have not been ploughed down generally survive as low earthworks or slight stony banks. From the air these are best viewed in low light conditions, especially in the early morning or evening.

### Cropmarks

Cropmarks are simply patterns in vegetation reflecting differences in the rate of germination, growth and ripening of a crop. These differences are caused by variations in the moisture and nutrient content of the soil. These variations in turn are caused by differences in the structure and profile of the subsoil and can be due to the presence of buried features.

For example natural fissures or man-made ditches in the underlying bedrock or subsoil are usually filled with deeper, richer soils and will retain more moisture than the surrounding undisturbed ground. Crops planted over a buried ditch will germinate quicker and grow more rapidly than the surrounding crop. In dry weather conditions they will grow taller and ripen later due to the extra reserves of moisture held in the buried ditch.



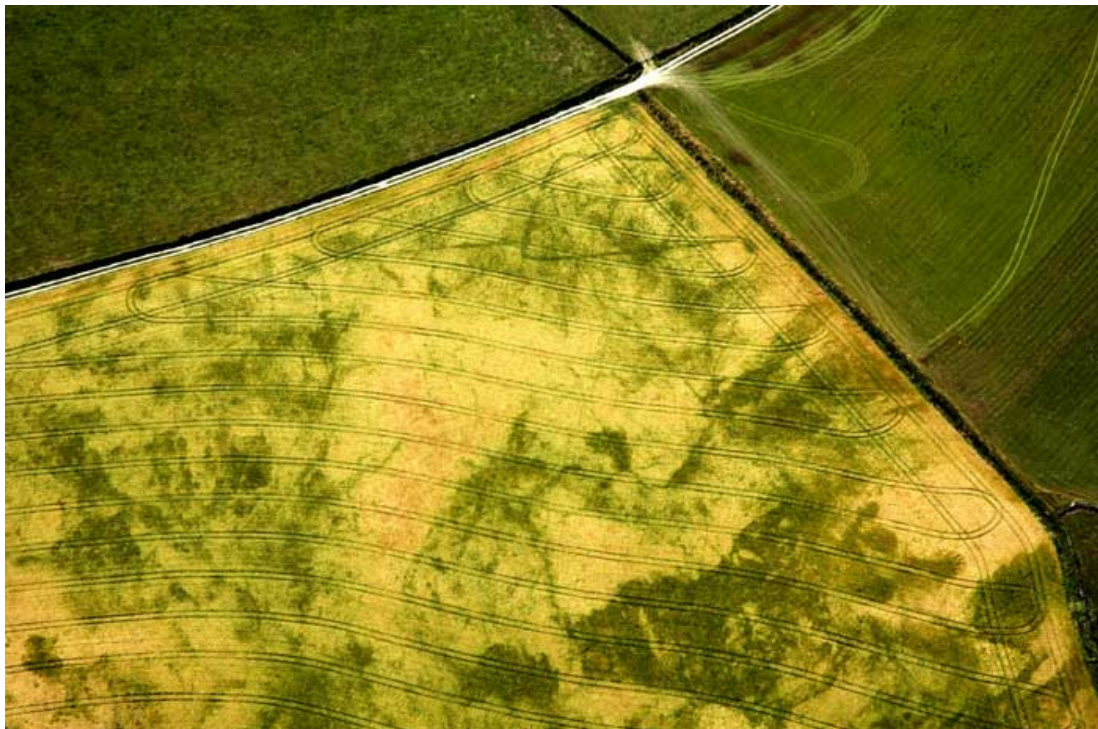
*Iron Age or Romano-British enclosures at Tregear showing as germination marks. The circular enclosure is surrounded by a bank and an outer ditch. The line of the ditch is marked by a green line where the crop has germinated and is growing strongly. The line of the bank is marked by a pale band of bare soil where the crop has not yet germinated. Photo © Cornwall County Council Historic Environment Service*

The opposite is true for buried walls or compacted surfaces which retain less moisture than the surrounding field. Here crops will germinate later, grow more

slowly and may be stunted due to the lack of moisture and nutrients. In drought conditions, crops planted over walled features will ripen more quickly than the surrounding crop.

In this way under the right conditions, buried archaeological features can be traced on the surface by their affect on the growing crop. Most archaeological sites have been levelled flat by years of ploughing and are no longer visible on the surface; these sites may only be visible as cropmarks. Since much of England has been cultivated, cropmarks are the most important source of information that can be recorded by the aerial archaeologist. The vast majority of the specialist oblique photographs held by the National Monuments Record are of cropmark sites.

Many types of crop develop cropmarks, although the best are found in cereals, especially wheat and barley. Cropmarks can be formed in all stages of a crop's growth cycle but the optimum time is from May to July when the crops are starting to ripen. Cropmarks are usually visible as differences in colour although sometimes as differences in height, in a similar way that earthworks are seen from the air.



*Roscarrock, St Endellion. Natural irregularities in the subsoil are causing the pattern of cropmarks visible as colour differences in this ripening cereal crop. In the top corner of the field a rectilinear ditched enclosure is clearly visible. Photo © Cornwall County Council Historic Environment Service*



*A prehistoric enclosure at Carnevas, St Merryn. Here the crop is beginning to ripen around the edges of the field. The line of the enclosure ditch is clearly marked by the crop over it growing taller than elsewhere. Photo © Cornwall County Council Historic Environment Service*

### **Soilmarks**

During ploughing time, in the months between autumn and spring, differences may be seen in the colour of freshly ploughed bare soils as lighter sub-soils are brought to the surface. When buried archaeological features are ploughed they cause differences in the colour of the soil across the field. Ditches will have filled with organic matter giving them a darker hue, whereas material forming banks or mounds will have been quarried from sub-soil deposits and are paler than the surrounding topsoil. With soilmarks therefore, the aerial archaeologist is looking directly at the archaeological deposits brought to the surface by the plough where they show as colour differences against the non-archaeological plough soil.



*An Iron Age enclosure visible as a soilmark at Helland. Material forming the enclosure bank has been brought to the surface where it shows as a pale band against the darker topsoil. © English Heritage. NMR. 18527/10*

### **Earthworks and stoneworks**

Earthwork sites are those where standing archaeological remains in the form of ditches, earth banks or low walls survive. Even the most substantial of earthworks can appear almost invisible in flat light so they are best photographed when the sun is low in the sky. The optimum times to photograph earthworks are in the early morning, the late evening or in winter, when the low angle of sun-light picks out the slightest of archaeological earthworks as highlights and shadow-marks.



*Sharp Tor, Linkinhorne. Earthworks of prehistoric field boundaries are clearly visible as shadow marks underlying the modern field system which was laid out in the eighteenth or nineteenth century. Photo © Cornwall County Council Historic Environment Service*

The direction of the sun is as important as its elevation in the sky. Different parts of site may be more or less easy to see due to their orientation in relation to the sun. A deep linear ditch would cast a good shadow along its length if it was orientated at right-angles to the sun, however the same feature would be almost invisible if the sun was shining directly along it.



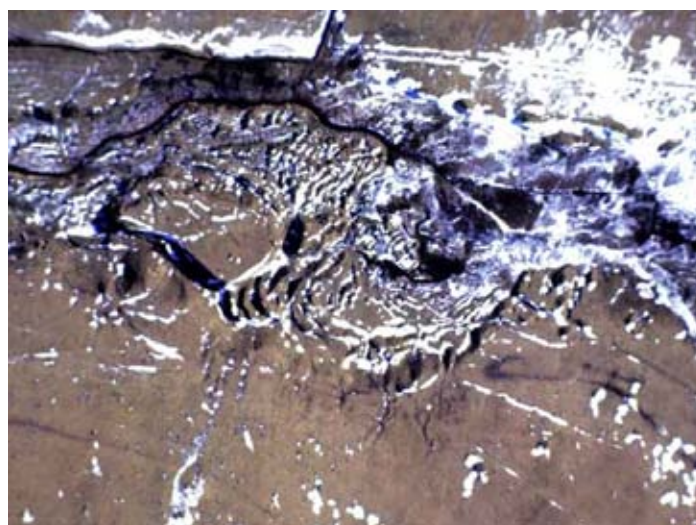
*Medieval tin streamworks and later mining remains on Craddock Moor, showing very clearly in low light. Photo © Cornwall County Council Historic Environment Service*

The vegetation covering an earthwork site will also affect how distinct the site is when viewed from the air. Shadow sites are most easily seen on heavily grassed pasture where the grass is kept short. Shadows are less distinct on areas of rough ground where heather and bracken create an uneven vegetation cover camouflaging the earthworks. Only the most substantial of earthworks can be identified under trees or shrub.



*Largin Castle, an Iron Age hillfort visible in dense woodland at Broadoak, Caradon. The interior of the hillfort is covered by ancient oak woodland, but all the surrounding ancient woodland has been replaced by conifers. Photo © Cornwall County Council Historic Environment Service*

Earthworks may also be accentuated by floodwater or by differential melting after a light fall of snow. The snow on the raised banks or low stone walls of a field system are likely to melt quicker than the surrounding area and these earthworks can be picked out as dark lines on the light snow. Alternatively snow lying in shallow ditches will melt slower than the surrounding areas.



*Tin streamworks at Altarnum, Bodmin Moor; the parallel patterns of spoil banks resulting from medieval streamworking are picked out by a light dusting of snow. Photo © Cornwall County Council Historic Environment Service*