Wealden district - Geology

Recent surface deposits

Throughout the region, there are locally widespread, but generally rather patchy, geological deposits of relatively recent origin formed over the past 2 to 3 million years and spanning the Ice Ages and Interglacial periods. These are known as superficial deposits, the most common of which were laid down by the local rivers or in coastal areas. These superficial deposits mainly comprise gravels, sands, clays and peat layers, which are soft and easily eroded as they have not been deeply buried and consolidated to form strong rocks. The most extensive are the river terrace and flood plain deposits of the main rivers and tributaries, and the coastal deposits of Romney Marsh—Dungeness and the Pevensey Levels. The thickness of these deposits is generally less than 10 m, and exceeds 30 m only locally. This region lay beyond the extent of the ice sheets that have dominated the evolution of the British landscape over the past 2 to 3 million years.

Geology at depth

Beneath the superficial deposits, or with just a cover of soil where such deposits are absent, are older rocks which geologists broadly split into two distinct types:

- The sedimentary bedrock geology is composed of quite hard rocks which were originally deposited from 350 to 40 million years ago as layers of sediments in shallow seas, deserts and vast river systems in times when Britain lay closer to the Equator and the climate and landscape were very different from those of today.
- The basement geology, which underlies the bedrock, is over 360 million years old and mainly comprises harder, denser rocks which have been strongly compacted and folded. They include both rocks originally deposited as sediments and others that are products of volcanic activity.

In the course of the past 500 million years there have been periods when the area of the UK formed a landmass and was being eroded, and other periods when it was sinking and new layers of sediment were being deposited. The history of erosion and deposition has not been the same in all parts of the UK. In the Wealden region the oldest sedimentary bedrock, which occurs in the central and southern parts, is similar to rocks occurring at the surface in parts of northern England and Wales. They include limestones, sandstones, and shales, and were buried and deformed by the forces of continental plates moving against each other. They are referred to here as the older sedimentary bedrock.

Subsequently, a younger sequence of sedimentary rocks, including limestones, sandstones and clays, was laid down and are known as the younger sedimentary bedrock. These include Jurassic rocks, comparable to those seen along the coast of Dorset and north Yorkshire. Under the North Downs, however, deposition stopped and instead uplift and erosion took place for hundreds of millions of years. When deposition restarted the Chalk Sea flooded the landscape and the Gault Clay and then the Chalk were laid down on a variety of different older sediments. This situation where younger rocks rest directly on rocks of different older ages because of uplift and erosion is referred to by geologists as an unconformity.
The younger sedimentary bedrocks occur at the surface and dictate the broad variations in the geography and land-use across the region. It is composed of varied rocks formed from about 250 to 40 million years ago, mainly as sediment layers in shallow seas, as deltas, in lakes or on extensive coastal plains. While generally harder and more consolidated than the superficial deposits, much of the younger sedimentary bedrock is quite soft and easily eroded. Figures P902279 and P902278 are vertical sections through the geology, referred to as geological cross-sections, and illustrate the variations across the region.

The youngest, uppermost layers of the bedrock (Palaeogene sediments) occur on the northern flank of the North Downs and on the southern slopes of the South Downs. The Chalk, which underlies the North Downs, Hampshire Downs and South Downs, forms an outwards-tilted rim around the Weald, which outlines an elongated arch or dome-shaped structure that is open to the east but closed westwards. Within this dome, which geologists term an anticline (see Figure P902279), the layers become gradually older towards the centre, so the oldest rocks that appear at the surface in this region (Purbeck Group) can be found in central East Sussex.

The lower parts of the sequence of younger sedimentary bedrock do not occur at surface anywhere in the Wealden region but can be seen to the west, especially along the ‘Jurassic Coast’ in Dorset. However, these concealed rocks can be treated as a downwards continuation of the rock layers found at the surface, and so it is convenient to treat them as part of the same sequence.

In the central and southern parts of the region the younger sedimentary bedrock rests on much older sedimentary bedrock (Carboniferous rocks). The latter are rocks from about 350 to 310 million years old and whilst most are sedimentary they have undergone periods of deep burial and deformation during ancient earth movements.

Beneath the North Downs, however, even older basement rocks (Devonian and pre-Devonian rocks) form the southern edge of an uplifted block called the London Platform, where these rocks occur less than about 500 m below the surface. This block has been an area of geological stability for at least 250 million years. There is a significant regional variation in the nature and thickness of the younger sedimentary bedrock, which over most of the region comprises all the uppermost kilometre of the subsurface. To describe this variation and that of the deeper lying rocks the region can be divided into three geographical areas: the North Downs, the Weald including the coastal lowlands...
of the Pevensey Levels and Romney Marsh, and the South Downs (Figure P902277).

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