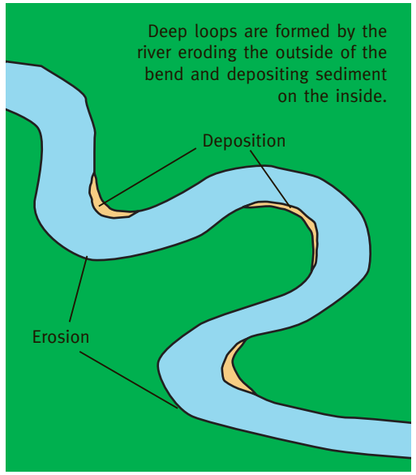
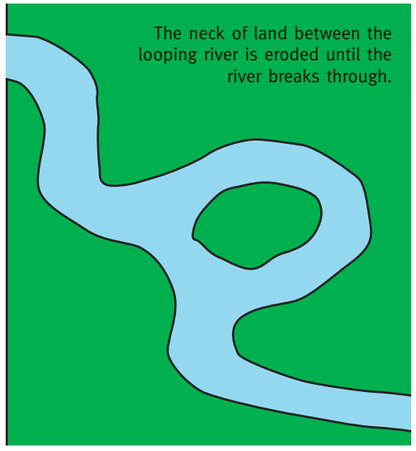
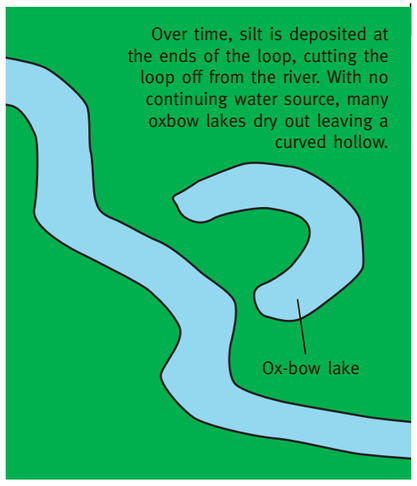


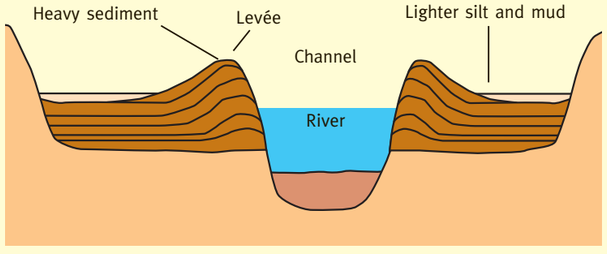




A mature river rarely runs in a straight line. Instead, it begins to sweep and curve through the land in bends and loops. This is called meandering. When a river flows in a bend or loop, its current is faster on the outside of the loop than on the inside. The faster-flowing current continues to erode land, while sediment is deposited on the inside edge. Meandering can cause small beaches to appear on the inside of bends and oxbow lakes to form. As a river enters a lake or sea it slows down further and drops much of its remaining sediment. Large rivers carry huge amounts of sediment. Sometimes, more of this is dropped than the tides or currents can carry away. When this happens, layers of sediment build up and form an area of flat land called a delta. Many deltas are fan or triangle shaped. The gradual rise in sediments can eventually cause the river to break up into smaller channels to carry the water into the sea.

Floodplains

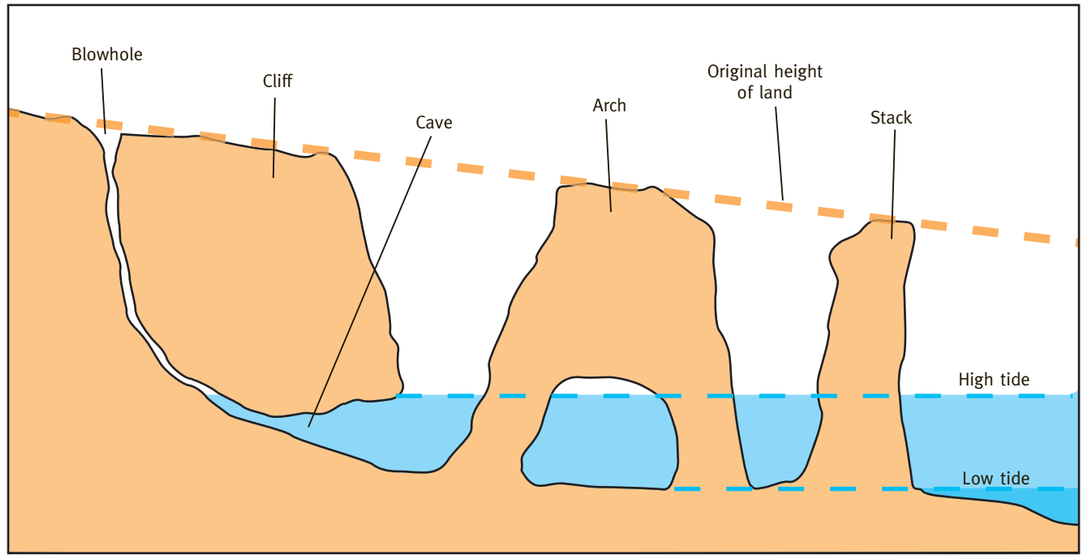
When a river floods, it covers the land either side of its banks with water containing sand and mud. The heaviest sediment is dropped first and this stays closest to the river, forming low walls or banks called levées. Further away from the river, lighter silts and mud are deposited; these remain even after the water moves back. Over many years of repeated floods, layers of extremely fertile land build up. These are floodplains and they have been vital to the development of human life. Many of the world's pioneering civilisations began building settlements and farming on floodplains close to rivers such as the Nile in Egypt, the Indus and Ganges in India, and China's Huang He (Yellow River).



▲ Floodplains are created when a river floods its banks and then recedes. Shallow banks called levées are formed around the river channel by the heavier material. Lighter silts and muds are carried further away.

The sea and coastal erosion

Powerful and relentless, the tides and waves of seas and oceans bombard the rocks, cliffs and shores of the Earth's coastlines. Just like rivers, they erode in a variety of ways. Hydraulic action (see page 21) can be a particularly erosive force, where strong waves force air into the cracks of a cliff face. The rocks, pebbles and sediment that waves carry and hurl against the land act as a powerful abrasive. This debris not only attacks the coastland, but is also rounded and worn down to form smooth pebbles, sand and more sediment. Sea water is slightly acidic and can dissolve limestone and chalk rocks, for example, attacking the weaker parts of cliffs, eventually causing them to collapse.



Many coastlines are formed from a mixture of hard and soft rocks, which erode at different rates. Sea caves are created by waves attacking areas of softer rock in coastal cliffs. The cave may begin as a very narrow crack that waves can penetrate. The waves exert tremendous force, cracking the rock from within. Sand and rock carried by waves produce additional erosive power on the cave's walls. A vertical hole, called a blowhole, which stretches from a cave up to the top of a cliff, can form through water eroding vertical joints in the rock. Water and sea spray can be forced up and out of the blowhole by the power of the waves.

▲ Coastal erosion causes many familiar features. Caves are formed in parts of cliffs that are made of softer rock. Arches are formed from harder rock, which is eroded much more slowly. When the roof of an arch is eroded away completely, stacks are left.