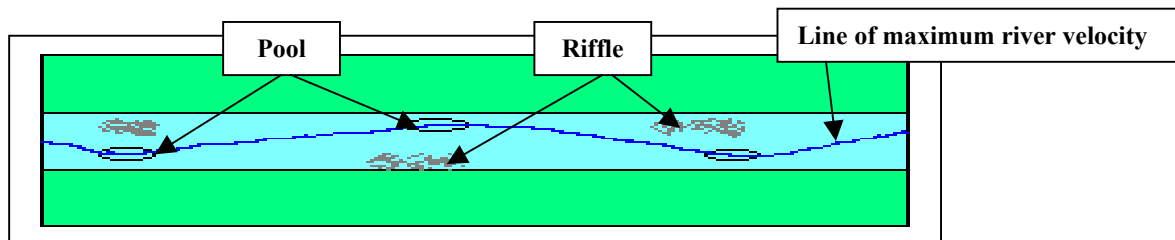


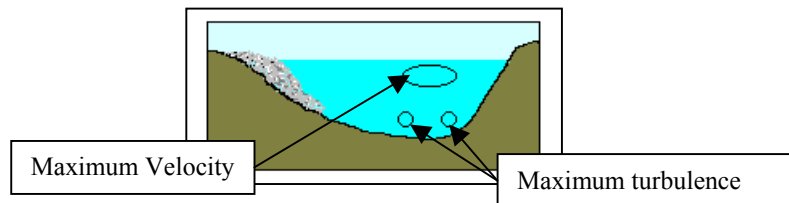
# Meanders and Oxbow lakes

A meander is a bend or a **loop in in a river channel**. Meanders tend to **occur in series** so that groups of meanders are found together. Typically, meanders are found in the **mature stage** of a river. However they are also found in the old stage where they become very pronounced and are also accompanied by oxbow lakes. Meanders are formed as a result of the processes of **erosion and deposition**. Erosion occurs laterally (sideways) in a meander. While meanders sometimes form because a river flows around obstacles in its course this does not explain why meanders form most commonly on landscapes which have no obstacles.

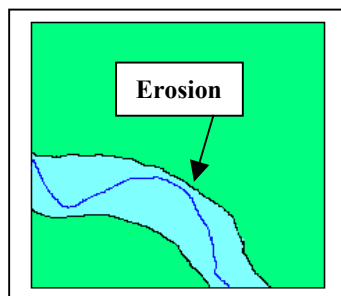
To understand why meanders form it is important to understand how water flows in a river channel. While a river channel may have straight banks, the water in the channel flows from one bank to the opposite bank. This creates a series of **pools** on opposite sides of the channel. Each pool is about 6 bed widths apart. These pools are slightly deeper parts of the channel. They are separated by shallows called **riffles**. Water flows into the pools and in doing so travels a little faster.



The flow of water in and around the pools is quite turbulent. As the water exits the pool it twists and travels towards the pool on the opposite bank. This sets up a **cork-screw like flow** of water in the river channel. While this flow is very complicated it results in a deepening of the channel.

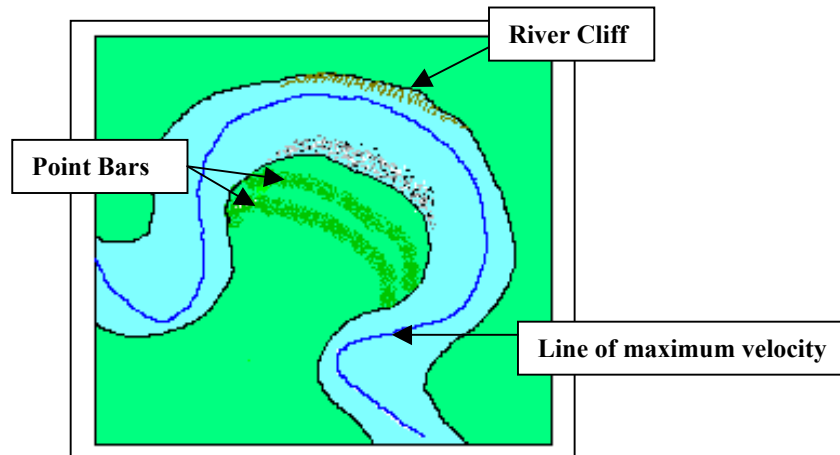


As water flows into the pools it erodes the adjacent bank through the processes of **abrasion and hydraulic action**. Abrasion occurs when the bedload of the river scours the base of the pool. The material of which the bank is composed is chipped and loosened. This process is assisted by hydraulic action which also carries eroded material away. The abrasion of the bed of the river undermines the river bank at the point of maximum turbulence. Eventually the river bank is weakened and collapses into the river. This causes the formation of a steep bank called a **river cliff**. This process causes the river channel to begin to bend. Once this happens the bend will begin to accentuate or loop even more. This is because in a meander erosion is concentrated along the line of maximum flow.

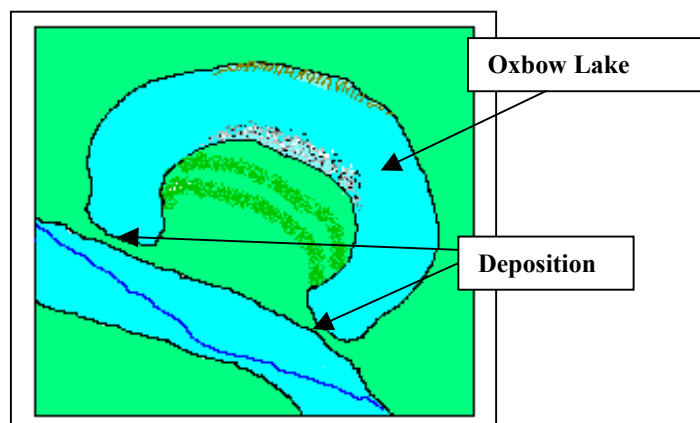


Erosion occurs on the **outer bank** of a meander where the river has most energy therefore deposition occurs on the **inner bank** where river energy is reduced. When a river loses energy it can not carry its bedload and therefore it deposits it. As a result a bed of sand and shingles (small stones and pebbles) is deposited on the bank opposite the river cliff. This deposit is called a **slip off slope**.

Over a long period of time, the river will migrate across its floodplain as the meander becomes more pronounced. A series of slip off slopes are deposited so that a series of **point bars** form and mark the former location of the inner river bank. Also, both ends of the meander will migrate towards each other because erosion occurs on the outside of the meander



Over a long period of time the two ends of the meander will grow towards each other so that they eventually join. During a flood, the river will cross the ends of the meander and flow straight, bypassing the meander loop and creating a **meander cut-off**. As a result, deposition will occur at the two points where the meander has been cut off since river energy is reduced here. Once the meander loop has been 'sealed off' an **oxbow lake** is left behind. Since the river now flows straight, it has more energy (same volume and same slope over a shorter distance) therefore the river will erode into its bed a little more. Consequently the oxbow lake will be at a level slightly above the river channel.



Meanders form on all rivers. Some excellent examples can be found on the **Mississippi River**, USA. If you are familiar with the soap 'Eastenders' you will have noticed the meanders of the **River Thames** in London shown in the opening sequence of the programme.