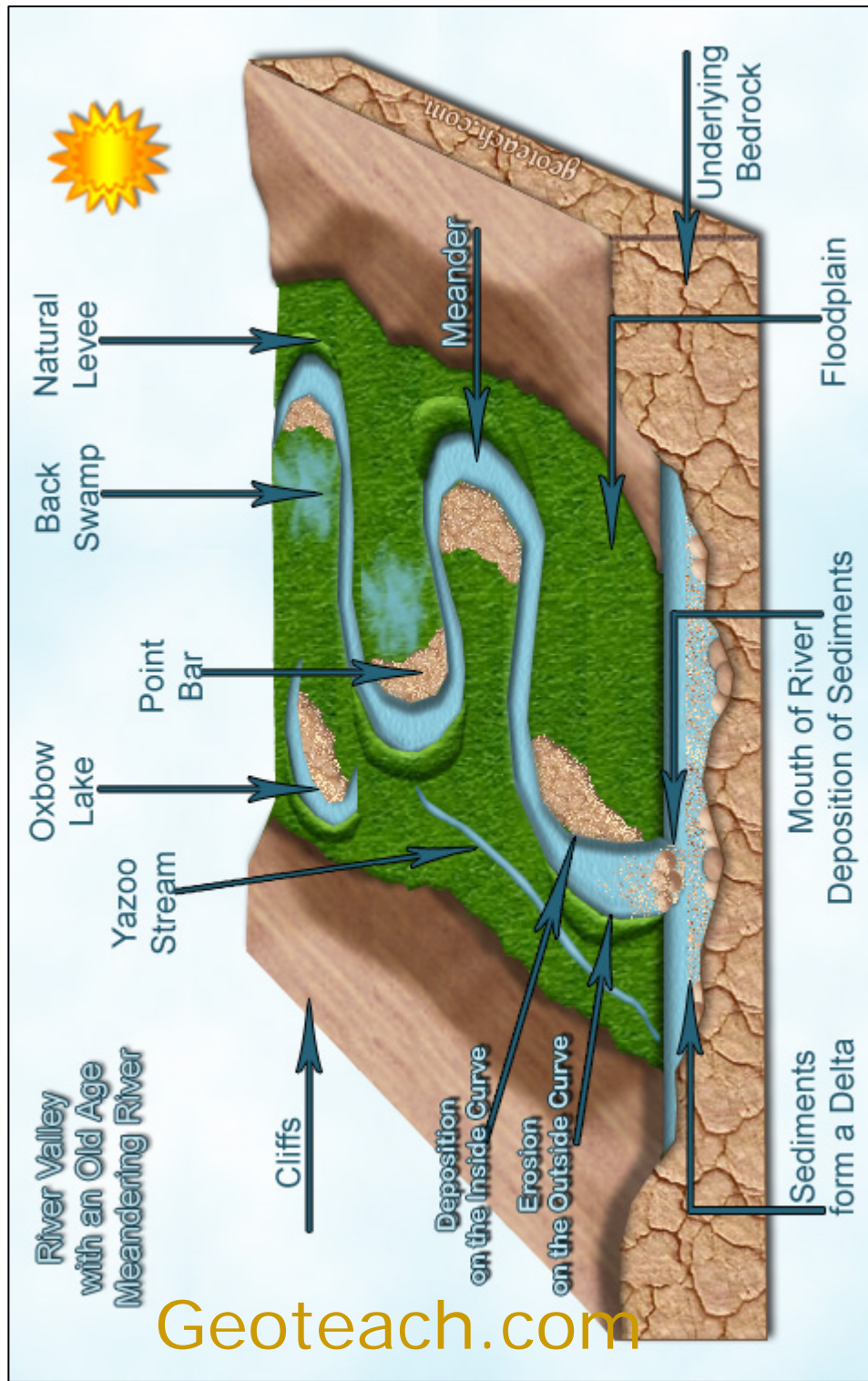


An Old Age River



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Classifying Rivers

Rivers are classified into 3 distinct "life stages": **Young Rivers**, **Mature Rivers** and **Old Age Rivers**.

What follows is a list of distinct characteristics that set an Old Age River stage apart from that of a Young or Mature River.

The Old Age River

The classic song, "Old Man River", was certainly written about an Old Age River. The Mississippi is such a river and its slow movement and suspended sediment make it appear, in some locations, more like a river of mud than a river of water. In fact, the Mississippi River can be so muddy that one may think twice before taking a dip.

That does not mean that an Old Age River cannot have its own dynamic behavior. During flood stages, water that overflows the river's banks, pouring over and beyond levees, attains velocities not only capable of moving large boulders, but also large houses! When Old Age Rivers are filled to capacity due to extensive periods of precipitation and the spring snowmelt around its tributaries, flooding makes the newspaper headlines. Extensive property and agricultural damage, as well as loss of life, are the results of hazardous flooding associated with Old Age Rivers.

Old Age Rivers actually have more distinguishing features to speak of than the Youthful and Mature Rivers do.

Upon observation of an Old Age River, as shown in the illustration above, here is what one might see:

1. The river flows down a very shallow gradient (slope).
2. The channel wider than it is deep with a very broad and U-shape due to extensive lateral (side-to-side) erosion.
3. Its velocity is quite slow and that means the river is...
4. Capable of moving small-sized sediments, i.e. silts and clays. Small sediments are suspended in the slow-moving water giving the river a "muddy" appearance. Dissolved salts and ions are carried in solution.
5. The general landscape surrounding the river is flatter and less steeply sloped. If hilly areas exist, they are further away from the river channel, keep at a distance by the wide floodplain which flanks the river.
6. A wide floodplain characterizes Old Age Rivers. There are grassy areas beside the river along which a person can walk. However, the floodplain is often marshy and swampy due to flooding of the river valley. In places, hip boots would be a good idea.
7. Curvy "S-shaped" *Meanders* are abundant and prominent features of an older river.
8. *Yazoo Streams* run parallel to the main river but do not always join it. They may be prevented from doing so by natural levees. Belated confluence (joining) of the Yazoo Stream and the main river may occur after over a hundred miles of flow.
9. *Oxbow Lakes* exist within the floodplain. Meanders were cut off from the main stream due to extensive erosion and deposition. The meander is now its own lake

but, with no water entering to replenish its supply, it will eventually dry up and become a *Meander Scar*.

10. *Natural Levees*, ridges formed by successive floods that deposit sediment over time, flank the outside meander curves.

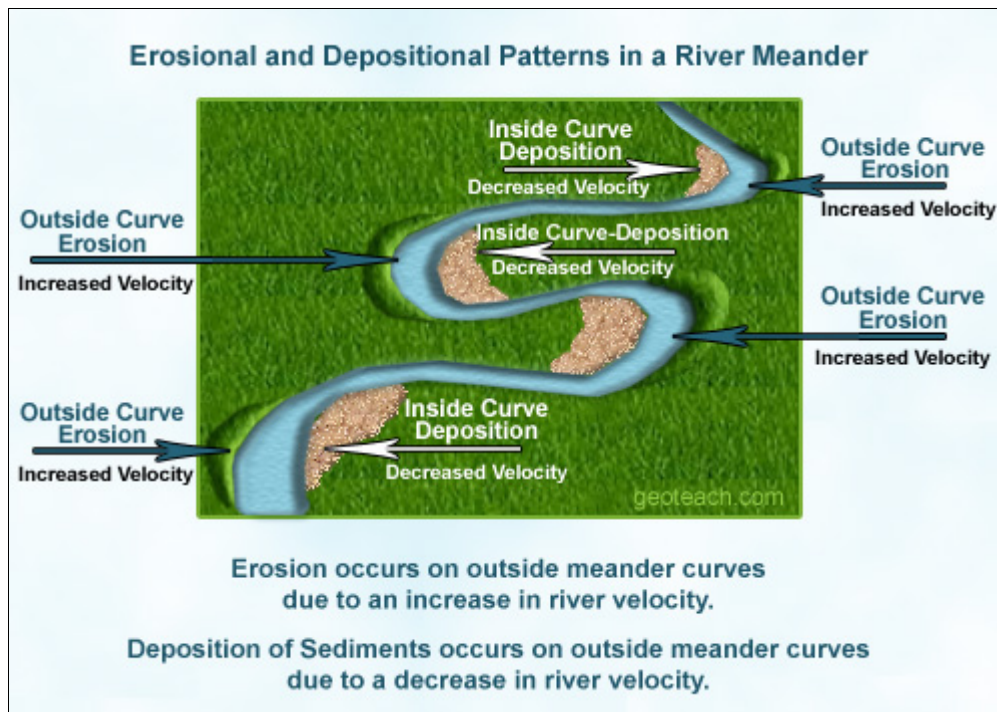
11. *Point bars* are areas of deposition on the inside curves of a meander. When water velocity decrease on the inside curves, deposition of sediment occurs, filling in the inside curve over time.

12. Fed by many smaller tributaries which join the main river at various locations, the discharge (volume of water), is quite large. This means that, although the river is capable of moving only the finer sediments, it can move large amounts of sediments.

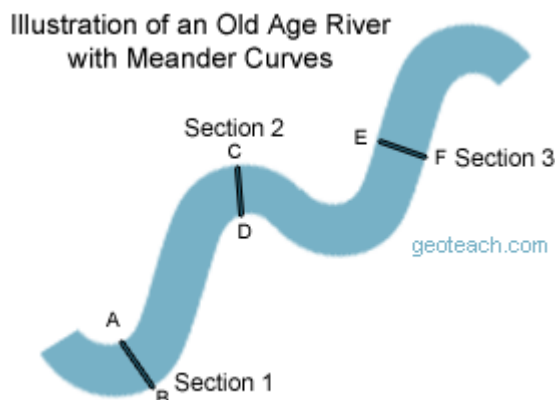
13. *Erosion* is present on the *outside curves* of meanders while *deposition* of sediments occurs on the *inside curves*.

Erosion and Deposition in a Meandering River

Observe this aerial view of a River and note how erosion and deposition take place with respect to the inside and outside curves:



Erosional and Depositional Cross-Sectional Views

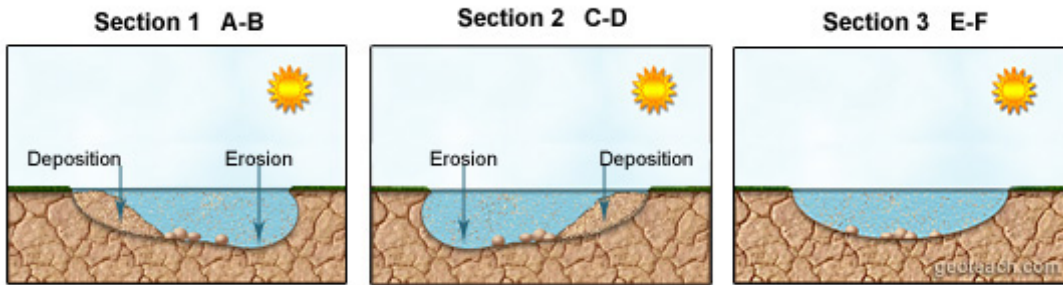


Observe the following illustration to see how the aerial view of the meandering river (above) corresponds to a cross-sections of 3 different locations.

The Illustration shows River Meanders. Lines have been drawn

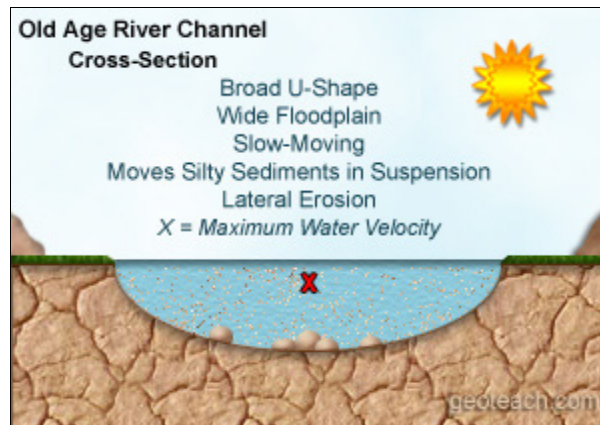
across the river where sections have been lettered for identification.

The following 3 cross sections correspond to each of the 3 sections in the picture on page 3. Notice how the erosional and depositional features change according to the positions of outside and inside curves. The straight section of the river (E-F) is a basic U-shaped channel.



You may want to view: [An Animated Visualization](#) showing lateral erosion by a meandering old age river: [Observe Changes in the Channel of a Meandering River](#).

Greatest Velocity in a River Cross-Section



The Red "X" in the Diagram

The **red "X"** in the large Young River illustration at the top of this page *marks the location where the river water flows the absolute fastest*. Despite whatever overall speed a river may be maintaining, in a cross-sectional consideration of river velocity, the water molecules are not all moving at the same speed. This is mainly due to *frictional drag*.

When a moving object comes in direct contact with another object, friction tends to slow down movement, reducing speed. At all locations where the river water comes in contact with the sides and bottom of the stream channel, there is frictional drag. Also, where the surface of the water comes into contact with the air, there is frictional drag.

The fastest moving water within the channel is located: dead center and just below the surface.

This area is as far away from contact with land surfaces as possible, yet removed from contact with the air.

Remember, we are referring to a cross-section here and not the length of an entire channel. With Old Age Rivers, when an entire river course is considered, there are areas of peak velocities on outside curves of meanders when compared to inside curves, as was already explained in the above sections.

How do Old Age Rivers Transport their Sediments?

Slow river velocity in Old Age Rivers generally allows for the transport of only fine sediments like silts and clay, which are carried in suspension.

Dissolved salts and ions are carried in solution.

During Flood Stages, when river velocity increases, it is possible for older rivers to carry larger sediments.

In any river stage, sediments are carried in the following ways:

Pebbles, Cobbles and Boulders (Bedload): Travel by rolling, sliding and bouncing along the streambed.

Sand-Sized Particles (Bedload): Move by *Saltation*. Small grains bounce along the river bottom, as if in a "colliding and jumping" motion.

Silts and Clay (Suspended Load): These are carried in *Suspension*.

Salts and Ions (Dissolved Load): Are carried in *Solution*.

Sediment Speed

- Sediments ***never*** travel faster than the river water itself.
- Dissolved salts travel at the same speed as the water.
- Bedload and suspended sediments always travel slower than the river water.

Velocity, Sediments, Erosion & Deposition - Saying it Simply:

The faster the water velocity, means the more sediments and also the larger sediments a river can transport:

- **Increased River Velocity = Larger Sediments + Increased Volume of Sediments + Increased Erosion**

- **Decreased River Velocity = Smaller Sediments + Decreased Volume of Sediments + Increased Deposition**

For ***an excellent animation*** showing **Sediment Transport**, visit: **Observe how sediment is transported by flowing water.**

Vocabulary that Relates to Rivers

Bank: as in River Bank: The margins of a channel. Banks are called right or left as viewed facing in the direction of the flow.

Bedload: The larger heavier particles that are being transported by a stream. Instead of being dissolved or suspended, these are being rolled or bounced along, spending at least part of their time in contact with the stream bottom.

Bedrock: Solid rock present beneath any soil, sediment or other surface cover. In some locations it may be exposed at Earth's surface.

Channel (watercourse): An open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water.

Delta: A deposit of sediment that forms where a stream enters a standing body of water such as a lake or ocean. The name is derived from the Greek letter "delta" because these deposits typically have a triangular shape in map view.

Deposition: The settling from suspension of transported sediments. Also, the precipitation of chemical sediments from mineral rich waters. In a river system, deposition is found on the inside curves where water velocity is slowest.

Discharge: The volume of water in a flowing stream that passes a given location in a unit of time. Frequently expressed in cubic feet per second or cubic meters per second. Calculated by the formula $Q = A \times V$ where Q is the discharge, A is the cross sectional area of the channel and V is the average velocity of the stream.

Downcutting: Refers to river erosion that cuts down into the bedrock below. Such erosion deepens channels, creating a V-shape.

Erosion: A general term applied to the wearing away and movement of earth materials by gravity, wind, water and ice. In a river system, erosion is more active on outside curves where water velocity is fastest.

Flood Plain: An area of alluvium-covered, relatively level land along the banks of a stream that is covered with water when the stream leaves its channel during a time of high flow.

Headwater(s): The upper portions of a drainage basin where the tributaries of a stream first begin flow.

Lateral Erosion: is common to mature and old age rivers where meanders erode the sides of a river's channel, widening the channel while creating an ever-widening floodplain during intermittent periods of flooding.

Levee: A long continuous ridge built by people along the banks of a stream to contain the water during times of high flow. Natural levees can also be built along the banks of a stream. When the flood water decelerates upon leaving the channel, sediments quickly drop out of suspension and build a ridge over time.

Meander: The bend in a stream.

Meandering Stream: A stream that has many bends (meanders). This type of drainage pattern usually develops on a nearly level landscape and where the banks of the stream are easily eroded.

Mouth: The lower portion of a drainage basin where a river ends and deposits its bedload in a lake or ocean.

Old Age: A stage in the development of a landscape when streams have a low gradient (slope) and meander back and forth across broad floodplains. The landscape is marked by meander scars, oxbow lakes, levees, point bars and swamps. Its course is graded to base level and running through a peneplain, or broad flat area.

Oxbow Lake: A crescent-shaped lake that forms when a meandering stream changes course. Such changes in course frequently occur during flood events when overbank waters erode a new channel.

Peneplain: A nearly flat land surface representing an advanced stage of erosion

Point Bar: A sand bar that develops on the inside curve of a meander bend due to the slowing of river velocity on the inside curves and resulting loss of a portion of bedload (sediments).

Sediment: A loose unconsolidated deposit of weathering debris, chemical precipitates or biological debris that accumulates on Earth's surface.

Swamp: Seasonally flooded land; A lowland region saturated with water.

Streambed: A channel occupied (or formerly occupied) by a stream

Tributary: A stream or river that flows into a larger river.

Yazoo Stream: A tributary that parallels the main channel for a considerable distance. Joining of these streams is normally blocked by a natural levee along the larger stream.

Youthful River: The earliest stage in the development of a landscape. During this stage streams are actively downcutting and flowing straight for long distances with frequent waterfalls and rapids. The valleys are typically steep sided and v-shaped.

Definitions are courtesy of:

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Science in Your Watershed, General Introduction and Hydrologic Definitions, W. B. Langbein and Kathleen T. Iseri, Manual of Hydrology: Part 1. General Surface-Water Techniques, USGS, 1872, 1995

The Free Dictionary.Com

Other Related Geoteach.com Documents

Old Age Meandering Rivers Assignment with Multiple Choice Questions
Three Stages of River Development - Lesson
The Stages of River Development Assignment
Young Rivers Assignment
Young Rivers - Lesson



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