

Chapter 9

Water Erosion and Deposition

9.1 Water Erosion and
Deposition
Notes Sheet

Runoff



Water that flows across the Earth's surface is called runoff. The water does not soak into the ground or evaporate.

Runoff

The amount of rain and length of time it falls are two factors that determine whether water will soak into the ground or run off.

Light rain falling over several hours will have time to soak into the ground.

Heavy rain falling in less than an hour will run off because it can't soak into the ground fast enough.

Runoff

The steepness, or slope, of the land also determines runoff.

Water moves quickly down steep slopes so it has little time to soak into the ground.

Water moves more slowly down gentle slopes and across flat area, allowing time to soak into the ground.

Runoff

Vegetation, such as grass and trees, also effects the amount of runoff.

Runoff slows down when it flows around plants.

By slowing down runoff, plants and their roots prevent soil from being carried away.

Runoff

Gravity is the attracting force that all objects have for one another. The greater the mass of an object the greater the forces of gravity.

Water runs downhill because of gravity.

When water runs down a slope it picks up speed.

As speed increases so does it energy.

Fast moving water carries more soil than slow moving water does.

Water Erosion

**The movement of soil and rock from one place to another is called erosion.
Water is an agent of erosion.**

Water Erosion

Running water can leave a groove or small ditch on the side of the slope. This is evidence of rill erosion.

Rill erosion begins when a small stream forms during a heavy rain. As the stream flows along it has enough energy to erode and carry away soil.

Water moving along the same path creates a groove called a channel on the slope where the water eroded the soil.

If the water flows in the same channel, the channel becomes broader and deeper and turns into gully erosion.

Water Erosion

Water often erodes without being in a channel.

Rainwater can flow off surfaces in thin, broad sheets, like off the hood of a car.

Sheet erosion occurs when water that is flowing as sheets picks up and carries away sediments.

Water Erosion

Sometimes water continues to flow along the low place, or channel, it has formed.

A stream channel becomes deeper and wider as water picks up sediments from the bottom and side of the channel.

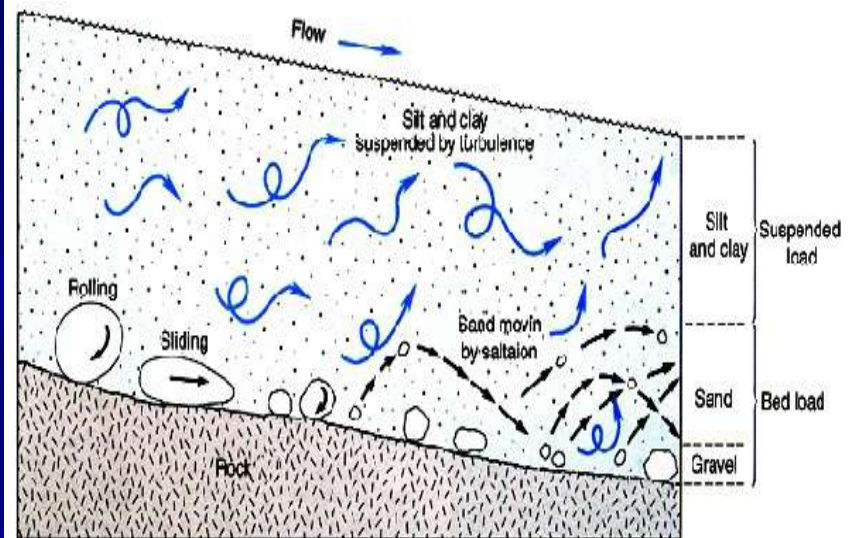
The sediment it carries is called its load.

Water picks up and carries lightweight sediments called the suspended load.

Larger heavy particles called the bed load just roll along the bottom of the stream channel.

Plummer and McGee, MINERAL GEOLOGY, 7th ed. © 1995 Times Mirror Higher Education Group, Inc., Dubuque, Iowa.

Sediment load of a stream. Figure 10.23



Water Erosion

Water can even dissolve some rocks and carry them away in solution.

The different sized sediments scrape against the bottom and the sides of channels and wear away the rock by the process of abrasion.

River System Development

Streams are part of river systems.

The water comes from rills, gullies, and smaller streams located upstream.

Runoff enters small streams, which join together to form larger streams. Larger streams come together to form rivers, which grow as more streams join.

River System Development

A drainage basin is the area of land from which a stream or river collects runoff.

A drainage basin is like a bathtub-all water that collects in it flows toward one location the drain. All the water in a river system flows to the main river.

The Mississippi River drainage basin is the largest in the U.S.

The mighty Mississippi

Mississippi River Drainage Basin



Stages of Stream Development

Streams come in a variety of forms-some are narrow and fast moving, others are wide and slow moving.

Streams differ because they have different stages of development.

These stages depend on the slope of the ground over which the stream flows.

The names of the stages of development are not always related to the actual age of the river.

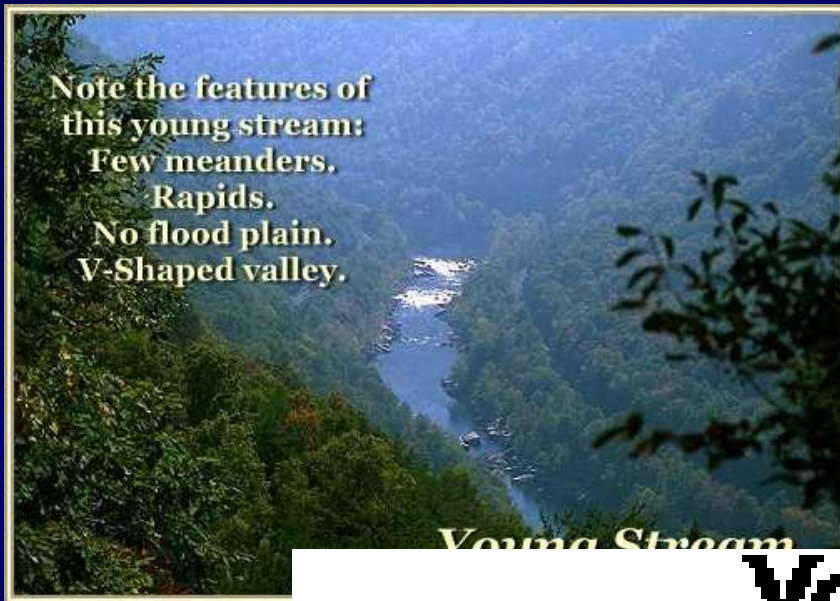
Stages of Stream Development

A stream that flows swiftly through a steep valley is a young stream.

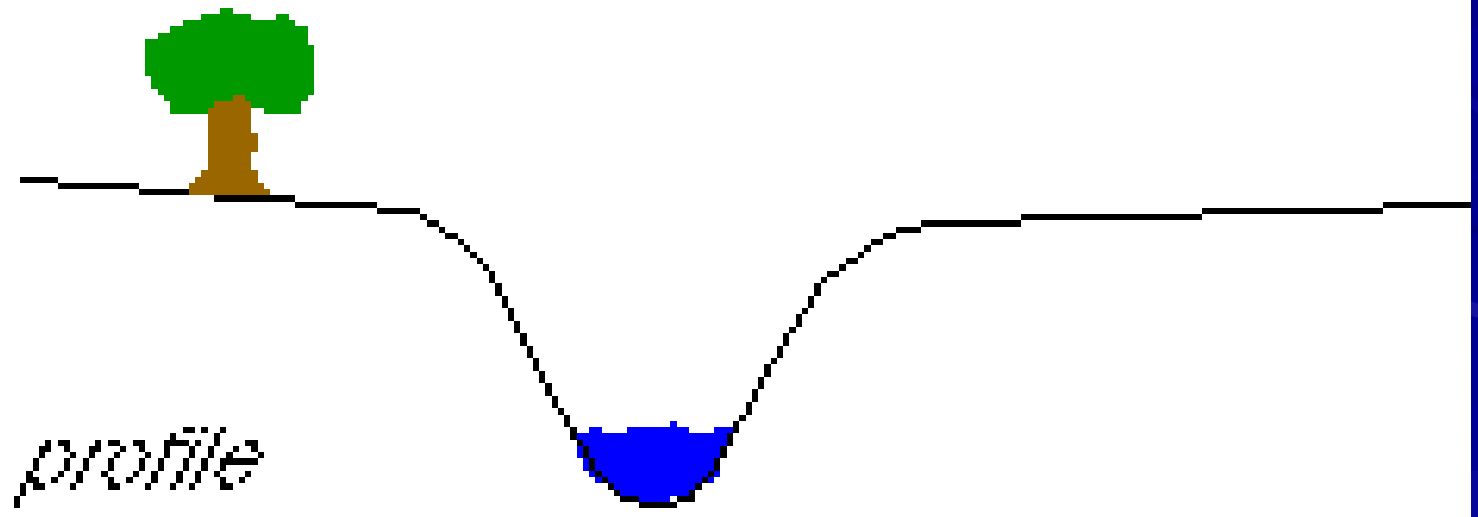
A young stream may have whitewater rapids and waterfalls.

Has a high level of energy and erodes the stream bottom faster than the sides.

Young Stream



Youthful

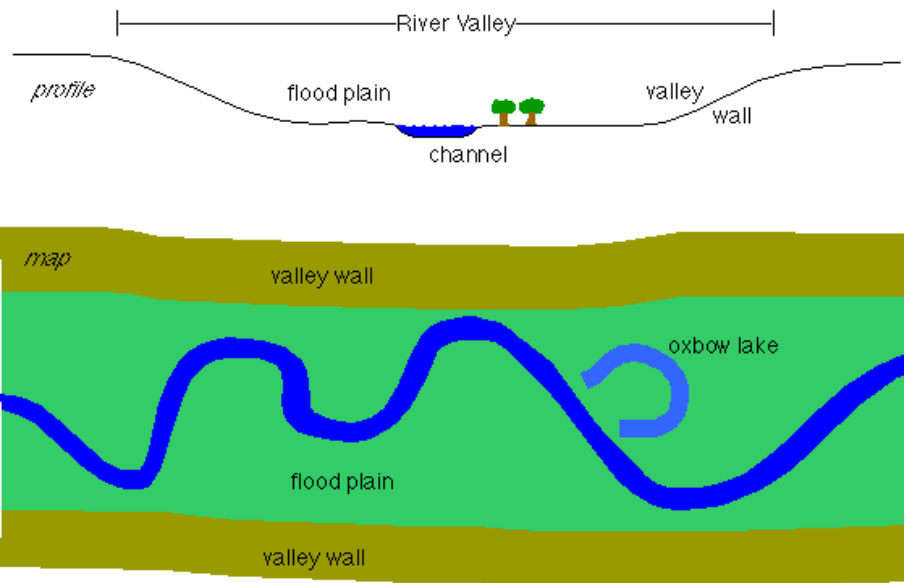


Stages of Stream Development

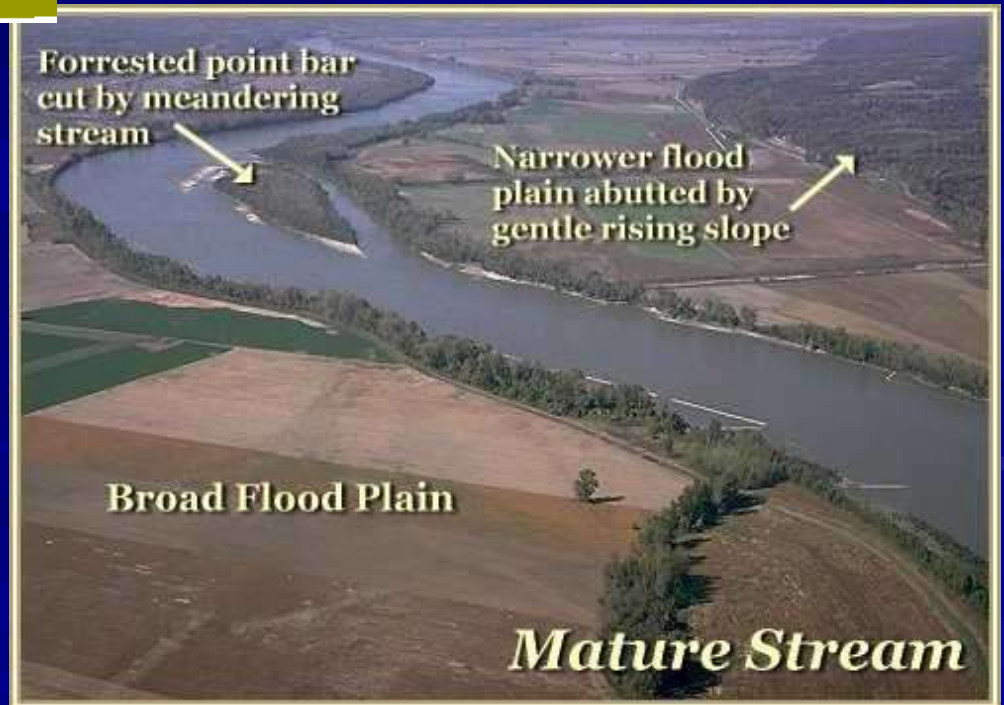
A mature stream flows more smoothly through it's valley. Most of the rocks in the streambed that cause waterfalls and rapids are eroded by running water and the sediments it carries.

Erosion is no longer concentrated on the bottom of the stream channel.

Mature



Mature Stream

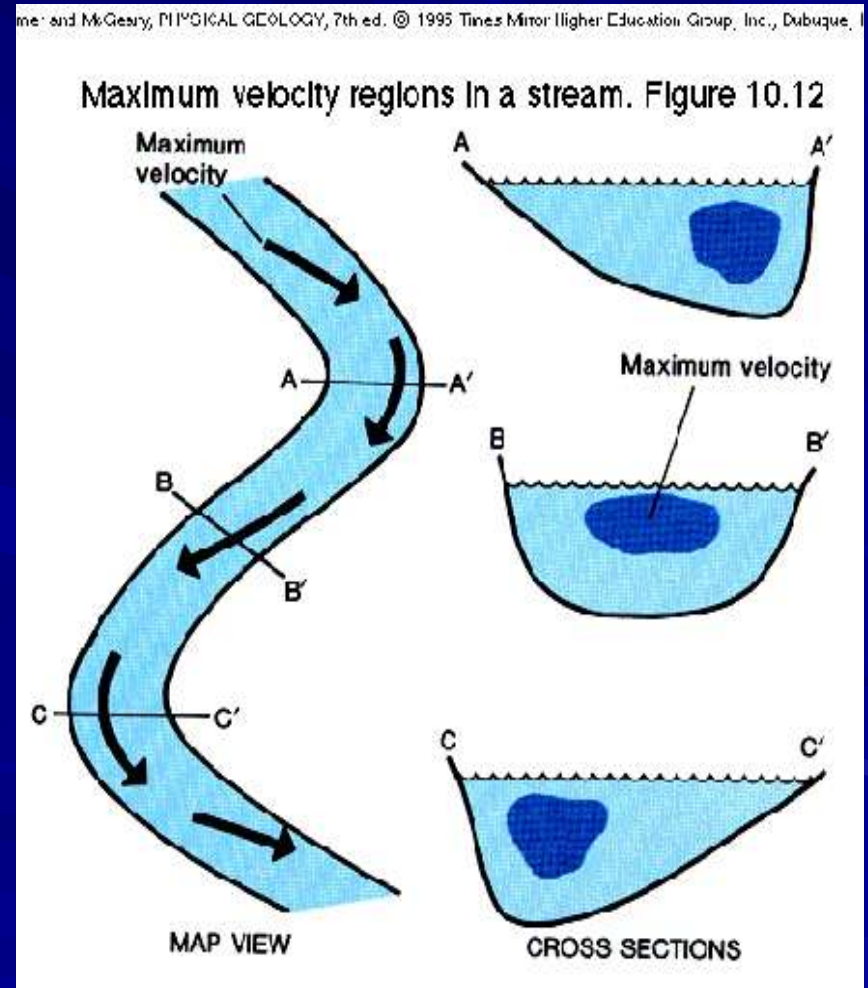


Stages of Stream Development

A mature stream erodes more along the sides and curves develop. These forms form because the speed of water changes throughout the width of the channel.

Water in shallow area of a stream moves slower because it drags along the bottom

In the deeper part of the river, the water moves faster.



Stages of Stream Development

If the deep part of the channel is next to one side of the river, water will erode that side and form a slight curve.

Over time the curve grows into a meander.

The broad flat valley floor formed by a meandering stream is called a flood plain.

Stages of River Development

The last stage of river development is the old stage.

An old stream flows smoothly through a broad floodplain.

Major river systems contain streams in all stages of development.

When a river system has too much water in it, floods can occur. These can be catastrophic and cause major damage.

Stream



Old Age



River System Picture



Deposition by Surface Water

As water moves through a river system it loses some of its energy of motion. The water can no longer carry some of its sediment. As a result, sediment is deposited to the bottom of the stream.

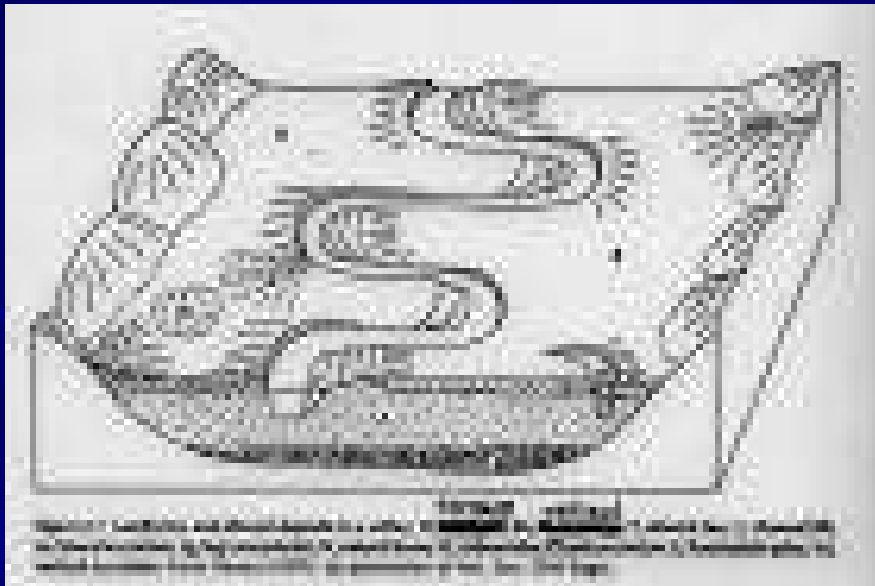
Sediment can be carried for long or short distances.

Sediment that is deposited as water empties into an ocean or lake form a triangular or fan-shaped deposit called a delta.

When river water empties from a mountain valley onto an open plain, the deposit is called an alluvial fan.

Flood Plain

Is the flat area on each side of a river that is submerged during a flood.



Delta

Deposition of sediments when a river empties into a body of water



Alluvial Fan

A cone shaped deposition of sediment where moving water empties onto dry land (arid regions)

