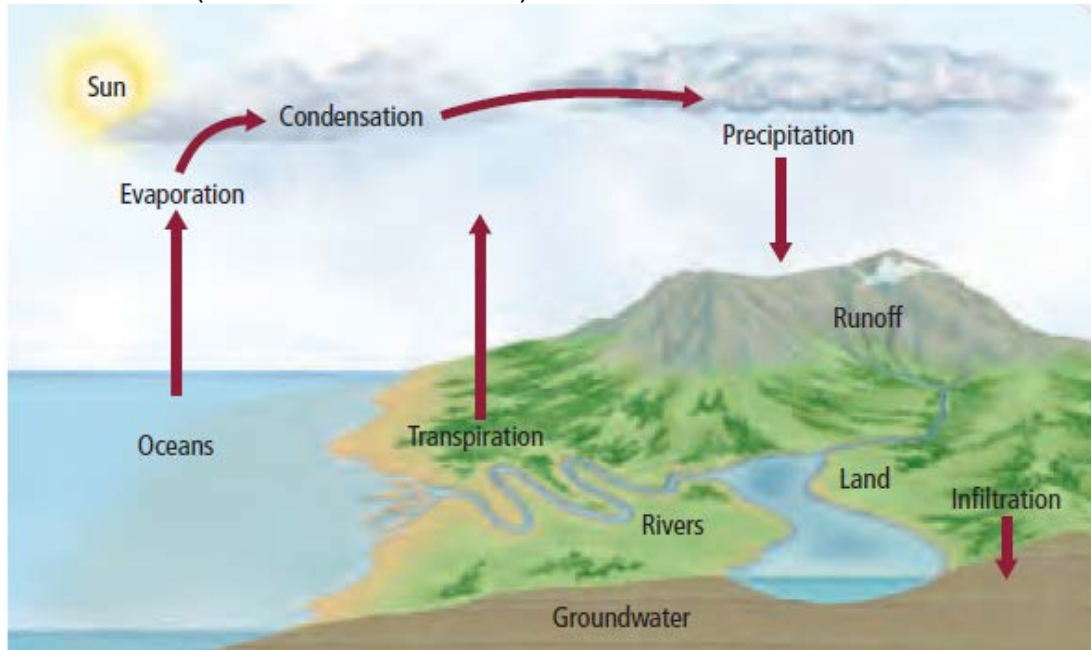


SURFACE WATERS: RIVERS AND STREAMS

Source: *Earth by McGraw Hill Publishing*

I. WATER CYCLE (OR HYDROLOGIC CYCLE)



Water or hydrologic cycle is the cycle of changes and movements that surface water and shallow groundwater repeatedly passes through. Hydrogeology is the study of the groundwater phase of the hydrologic cycle.

Processes involved in hydrologic cycle:

- Evaporation
- Transpiration
- Condensation
- Precipitation
- Infiltration

Review the definition of different processes involved in hydrologic cycle.

II. RUNOFF

Runoff is the water flowing downslope along Earth's surface. It might reach a stream, river, or lake, it might evaporate, or accumulate in puddles in small depressions and infiltrate the ground. Water that infiltrates Earth's surface becomes groundwater.

Factors affecting runoff:

1. Soil composition
2. Rate of precipitation
3. Vegetation
4. Slope

III. STREAM SYSTEM

How are streams formed?

Precipitation that does not enter the ground usually runs off the surface quickly. Some surface water flows in thin sheets (stream wash) and eventually collects in small channels, which are the physical areas where streams flow. As the amount of runoff increases, the channels widen, deepen, and become longer. Although these small channels often dry up after precipitation stops, the channels fill with water each time it rains and become larger and longer.

Stream formation relies on an adequate water supply. Precipitation provides water for the beginnings of stream formation. Streams can also be fed by underground deposits of water. As a stream develops, it changes width and size, and shapes the land over which it flows.

Tributaries – rivers that flow into other streams.

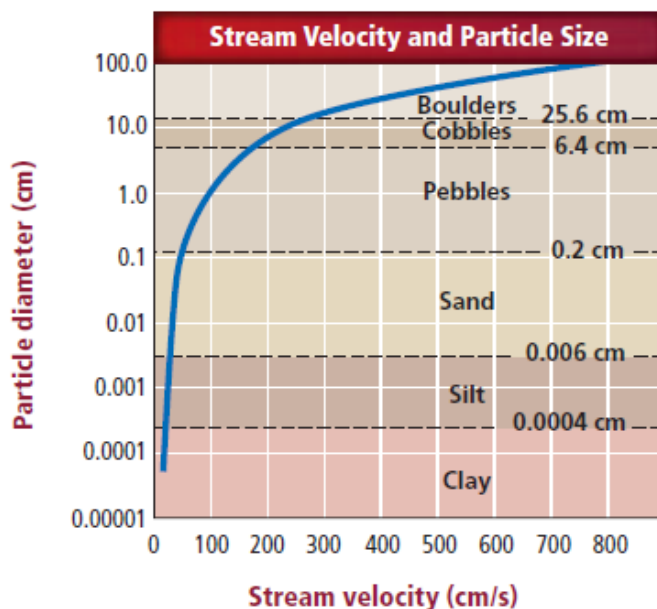
Watershed – all of the land area whose water drains into a stream system.

Divide – a high land area that separates one watershed from another.

IV. STREAM LOAD

Stream load is the material that a stream carries in the following ways:

1. Materials in suspension
Suspension – method of transport for all particles small enough to be held up by the turbulence of a stream's moving water.
2. Bed load – consists of sand, pebbles, and cobbles that the stream's water can roll or push along the bed of the stream. This load often causes abrasion (the process of erosion in which windblown or waterborne particles, such as sand, scrape against rock surfaces or other materials and wear them away.)
3. Materials in solution
Solution – method of transport for materials that are dissolved in stream's water. The amount of dissolved material that water carries is often expressed in parts per million (ppm).



V. STREAM CARRYING CAPACITY

Stream carrying capacity depends on: 1.) velocity 2.) amount of water moving in the stream.

Discharge – is the measure of the volume of stream water that flows past a particular location within a given period of time. It is commonly expressed in cubic meters per second (m³/s).

$$\text{Discharge (m}^3\text{/s)} = \text{average width (m)} \times \text{average depth (m)} \times \text{average velocity (m/s)}$$

VI. STREAM DEVELOPMENT

Headwater – region where water first accumulate to supply a stream.

Stream channel – narrow pathway into the sediment or rock.

Stream banks – hold the moving stream water within.

Headward erosion – when small streams erode away the rock or soil at the head of the stream.

Stream capture – the process where a stream erodes the high area separating two drainage basins and joins another stream.

Stream gradient – or the slope where there is downward movement of stream water.

Base level – elevation at which a stream enters a body of water or another stream. The lowest base level is sea level.

Meander – a bend or curve in a stream channel caused by moving water.

Oxbow lakes – as stream meanders continue to develop and become larger and wider over time, it is common for a stream to cut off a meander and once again flow along a straighter path. The stream then deposits material along the adjoining meander and eventually blocks off its water supply. The blocked-off meander becomes an oxbow lake.

VII. FLOODS

Flood occurs when water spills over the sides of a stream's banks onto adjacent land. Floodplain is the broad, flat area that extends out from a stream's bank and is covered by excess water during times of flooding.

Natural levees – continuous ridges developed along the sides of the river from sedimentation settling onto the stream's floodplain.

VIII. DEPOSITION OF SEDIMENT

When streams lose velocity, they lose some of the energy needed to transport sediment, and deposition of sediment occurs.

Alluvial fans – sloping depositional features formed at the bases of slopes and are composed mostly of sand and gravel.

Delta – triangular deposit that forms where a stream enters a large body of water.

IX. REJUVENATION

Downcutting – wearing away of the streambed and is a major erosional process that influences the stream until it reaches its base level.

Rejuvenation – stream actively resumes the process of downcutting towards its base level until it cuts downward into the existing meanders. Rejuvenation can cause deep-sided canyons to form.