

Some notes on streams

Hydrologic system: (1) ice and water vapor in the atmosphere, (2) surface water in lakes, rivers, (3) frozen water in snow, ice, glaciers, (4) surface water in the ocean, (5) ground water in pore space and fractures below the ground surface

Water budget on Earth: 97.6% salt water, 1.8% glacial ice, 0.6% ground water, <0.002% fresh water on the surface (streams, lakes)

97% of the useable fresh water on Earth is ground water; however, most of the water used by urban populations is surface water

Urbanization affects the recharge of ground water reservoirs and increases the severity of floods

Streams have a collecting (**tributary**) system, a transporting system, and a dispersing (**distributary**) system that usually involves some sort of **delta**.

Base level: the local or regional low spot to which the surface streams flow

Discharge: the volume of water passing a recording station during a unit of time

Gradient: the slope of a stream channel. Gradient is the change in elevation divided by horizontal distance over which the elevation change occurs (rise over run)

Sediment load: the amount of sediment transported by a river

Changes in a river as it flows downstream: **gradient decreases, channel width increases, discharge increases, average velocity increases**

Three general types of streams (as examples of a wide continuum of stream types)

(1) **Incised** streams have eroded a channel into the surrounding rock/sediment, and the channel shape is constrained by the valley/gorge walls

(2) **Braided** streams have multiple channels that are simultaneously active, separated by sand/gravel bars. Braided streams tend to form where the stream-channel gradient is high, the sediment load is high, or the discharge is high.

(3) **Meandering** streams usually have a single active channel that follows a very curvy path (somewhat like a sine wave) across the ground surface. Meandering streams tend to form under many conditions of gradient, sediment load, and discharge.

Topographic contour lines are lines of equal gravitational potential energy. Surface flow will be perpendicular to the equipotential lines.

The inside of a meander bend is called the **point bar**, because it is typically a sand bar located on a point of land that the river flows around. The outside of a meander bend is called the **cut bank**, because erosion along the outer part of the flowing river is constantly cutting into the outside bank.

In a meandering stream, the velocity of the flowing water varies throughout the channel in a predictable manner. The shallow water along the point bar flows slowest, allowing sand to be deposited temporarily. The water along the channel bottom is slowed by viscous drag with whatever rocks, logs, old Chevys or mafia bosses may be at the bottom. The water along the upper surface of the stream is slowed a bit by interactions with the atmosphere. The fastest water in a meander bend is toward the outside of the meander, below the upper surface and above the deepest part of the channel.

Terms to learn: flood plain, cutoff, point bar, backswamp, natural levee, meander neck, oxbow lake, cut bank, Yazoo stream.

A "100-year recurrence-interval flood" has a 1-in-100 probability of occurring in any given year. That does **NOT** imply that a 100-year flood will occur only once in 100 years. If you live within a flood plain, expect to be flooded, to lose all of your belongings, and possibly your health/life and that of your loved ones.