Erosion

1.  Sediments that have been moved into a region from another place by natural processes are called transported sediments.

2.  Sediments that formed in their present location are called residual sediments.

3.  The removal and transport of sediments is called erosion.

4.  Transported sediments are much more common than residual sediments and are evidence of erosion over large portions of the earth's surface.

5.  Gravity is the main driving force of all erosional processes.

6.  Gravity may act alone as an erosional agent, producing such effects as landslides, slumping, and hillside creep.  This is called mass wasting.

7.  **Running water is the predominant agent of erosion on the earth.**

8.  Every stream and its branches make up a single system that collects all the runoff with a definite area called the drainage basin of the system.

9.  A stream system consists of running water, the land surface it drains, the sediment it transports, and the potential energy used to drive it.

10.  As the slope of a stream bed increases, the average velocity of the stream increases.

11.  An increase in the discharge of a stream increases its average velocity.

12.  Streams transport sediments as ions in solution, as suspended matter, and by the bouncing and rolling of particles along the stream bed.

13.  The size of the sediments that a stream can transport increases as the stream velocity increases.

14.  The total amount of sediment that a stream can transport increases as its discharge increases.

15.  Youthful streams carrying sediments down steep gradients can cut through solid bedrock.

16.  When youthful, streams have V-shaped valleys.

17.  In the stage of maturity the valley of a stream widens.  The stream ceases to cut through the bedrock.

18.  In old age, the stream develops a wide flood plain, across which it wanders seeking the lowest elevation in a series of curves, or meanders.  The outside curve of the meander (fastest velocity) is usually a cut bank due to erosion.  The inside curve of the meander (slowest velocity) is usually a sand bar due to deposition.  In straight channels, the stream's velocity is greatest in the middle just below the surface.

19.  Moving ice, called glaciers, can erode rock and transport sediments.  Erratics are rocks that have been transported and do not match the bedrock beneath them.  Glaciers form U-shaped valleys.  Valley glaciers move fastest in the middle top and slowest at the sides and bottom because of friction with the walls.

Glaciers are bodies of ice that form from the accumulation of snow and advance because of gravity. Snow accumulating on the ground (firn) is a sedimentary rock that coverts to glacial ice, a metamorphic rock, by compaction (pressure) and recrystallization (heat).

Glaciers exist as either valley glaciers, occupying old stream valleys at high elevations, or continental glaciers, ice sheets covering wide continental areas at lower elevations.

 The zone of accumulation lies above the snow equilibrium line and has perennial snow cover, while ice is lost in the zone of ablation, below the snow equilibrium line, by evaporation, melting or calving at the terminus. Advancing glaciers have a positive ice budget (accumulation > ablation - wasting away), while retreating glaciers have a negative ice budget (accumulation < ablation).

Rock fragments transported at the base of a glacier are effective erosional agents. Erosion by valley glaciers produces most of the scenery in mountainous regions. Striated and groove bedrock is a common erosional feature of both alpine and continental glaciation. Valley glaciers produce U-shaped valleys, truncated spurs, hanging valleys and rock-basin lakes as they modify old stream valleys. Cirques, horns and arêtes are formed by valley glaciers in combination with weathering and erosion.

Glacial deposits are either unsorted, unlayered, angular rock debris called till, or sorted, layered material called outwash that is deposited by meltwater. Moraines are ridges of till formed by valley and continental glaciers while the terminus is stationary. Both can form end, terminal, recessional, and ground moraines. Valley glaciers also form lateral and medial moraines because of rockfalls along their edges and convergence into trunk glaciers. Continental glaciers deposit drumlins, spoon-shaped hills of till with a gentle dip in the direction of ice movement. Outwash plains form in front of a glacier from meltwater.

Other depositional features associated with continental glaciers are kettles, rock flour and loess,  Much of the current landscape is the result of glacial effects. Scoured bedrock in Canada and thick tills in the central United States were directly caused by continental glaciation. The Great Lakes were eroded by continental glaciers as well.  As glaciers advanced during the Ice Ages, sea level fell, causing fiords along the coastlines of Alaska, Norway and elsewhere. Uplifted and tilted shorelines around the Great Lakes indicate crustal rebound from removal of the weight of continental ice sheets.

20.  Wind can transport sediment of sand size or smaller and can produce distinctive features by deflation and abrasion - mostly in arid regions.  Sandblasting occurs when winds blow sand or silt grains against rocks and other objects.  Deflation removes sand and lowers the land surface.

21.  Wave action erodes shoreline rocks and beaches - cliffs that are cut by waves and spits caused by **long shore current**.  Long shore current carries large amounts of sediment and it always flows parallel to the shore.  Most waves strike the coastline at an angle and these bent waves usually result in the long shore current flowing along the shore in one direction.  Sand bar deposits and spits will grow in the direction of the long shore current.

Each agent of erosion produces distinctive changes in the material it transports.

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| --- | --- | --- | --- |
| Water | Ice | Wind | Gravity |
| rounded | angular to sub rounded | sorted - cross bedding | angular |
| smooth | unsorted - till | frosted and pitted | unsorted |
| sorted - vertical/horizontal | striations, polished | sand and silt | talus |
| V-shaped valleys | U-shaped valleys | mushroom shaped rocks |  |