

EROSION



EROSION

a process in which the materials of Earth's surface are loosened, dissolved, or worn away and transported from one place to another by a natural agent

- ✘ When rock weathers, the resulting rock particles do not always stay near the parent rock.

SOIL EROSION

- ✘ Soil erosion has been occurring since the first land plants formed the first soil (~450 million years ago)
- ✘ Ordinarily, new soil forms about as fast as existing soil erodes.
- ✘ Some farming and ranching practices increase soil erosion.
- ✘ Soil erosion is considered by some scientists to be the greatest environmental problem that faces the world today.

GULLYING AND SHEET EROSION

- ✘ Gullying – large channels formed by runoff
- ✘ A farming technique that can accelerate soil erosion is the plowing of furrows, or long, narrow rows.
- ✘ As soil is washed away with each rainfall, a furrow becomes larger and forms a small gully.
- ✘ Eventually land that is plowed in this way can become covered with deep gullies.



Sheet erosion the process by which water flows over a layer of soil and removes the topsoil

- ✘ Sheet erosion may occur where continuous rainfall washes away layers of the topsoil.
- ✘ Wind also can cause sheet erosion during unusually dry periods.

Sheet Erosion due to rainfall > infiltration



RESULTS OF SOIL EROSION

- ✘ Constant erosion reduces the fertility of the soil by removing the A horizon, which contains the fertile humus (organic matter).
- ✘ The B horizon, which does not contain much organic matter, is difficult to farm because it is much less fertile than the A horizon.
- ✘ Without plants, the B horizon has nothing to protect it from further erosion.
- ✘ So, within a few years, all the soil layers could be removed by continuous erosion.

SOIL CONSERVATION

- ✘ Certain farming and grazing techniques and construction projects can also increase the rate of erosion.
- ✘ Land clearing removes protective ground cover plants and accelerates topsoil erosions.
- ✘ But rapid, destructive soil erosion can be prevented by soil conservation methods.

Contour Plowing

- ✘ Farmers in countries around the world use planting techniques to reduce soil erosion.
- ✘ In one method, called *contour plowing*, soil is plowed in curved bands that follow the contour, or shape of the land.
- ✘ This method of planting prevents water from flowing directly down slopes, so the method prevents gullying.



Strip-Cropping

- ✘ In *strip-cropping*, crops are planted in alternating bands perpendicular to the erosive wind direction
- ✘ The *cover crop* protects the soil by slowing the runoff of rainwater.
- ✘ Strip-cropping is often combined with contour plowing. The combination of these two methods can reduce soil erosion by 75%.



Terracing

- ✘ The construction of steplike ridges that follow the contours of a sloped field is called *terracing*.
- ✘ Terraces, especially those used for growing rice in Asia, prevent or slow the downslope movement of water and thus prevent rapid erosion



Crop Rotation

- ✘ In *crop rotation*, farmers plant one type of crop one year and a different type of crop the next.
- ✘ For example, crops that expose the soil to the full effects of erosion may be planted one year, and a cover crop will be planted the next year.
- ✘ Crop rotation stops erosion in its early stages, which allows small gullies that formed during one growing season to fill with soil during the next

EROSION AND LANDFORMS

- ✘ There are three major landforms that are shaped by weathering and erosion—*mountains*, *plains*, and *plateaus*. Minor landforms include hills, valleys, and dunes.
- ✘ All landforms are subject to two opposing processes. One process bends, breaks and lifts Earth's crust and thus creates elevated, or uplifted, landforms.
- ✘ The other process is weathering and erosion, which wears down land surfaces.

MOUNTAINS

- ✘ During the early stages in the history of a mountain, the mountain undergoes uplift.
- ✘ When the forces stop uplifting the mountain, weathering and erosion wear down the rugged peaks to rounded peaks and gentle slopes.
- ✘ Over millions of years, mountains that are not being uplifted become low, featureless surfaces. These areas are called *peneplains*, which means “almost flat.”



PLAINS AND PLATEAUS

- ✘ A *plain* is a relatively flat landform near sea level. A *plateau* is a broad, flat landform that has a high elevation.
- ✘ A plateau is subject to much more erosion than a plain.
- ✘ The effect of weathering and erosion on a plateau depends on the climate and the composition and structure of the rock.
- ✘ As a plateau ages, erosion may dissect the plateau into smaller, table-like areas called *mesas*.
- ✘ Mesas ultimately erode to small, narrow-topped formations called *buttes*.

PLAINS AND PLATEAU

✘ Plains



Plateau



MESA

- ✘ Mesa-an eroded, table-shaped plateau
- ✘ Butte-is a mesa that has eroded even further to become a small, narrow topped formation



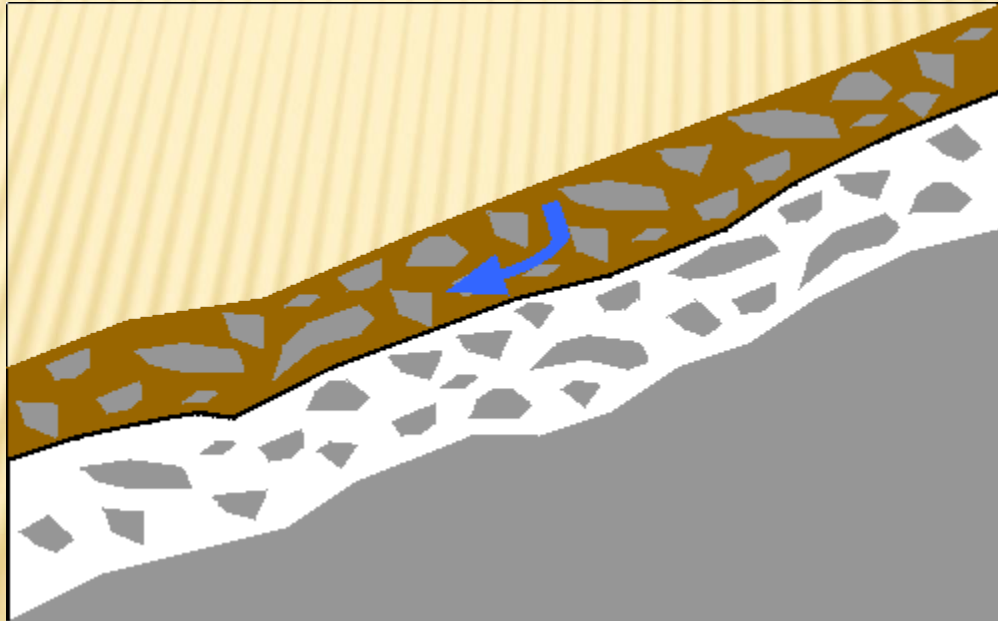


GRAVITY

- ✘ Mass movement: the movement of a large mass of sediment or a section of land
- ✘ Some movements occur rapidly, and others occur very slowly.

SOLIFLUCTION AND CREEP

- ✘ Solifluction: The slow, downslope flow of soil saturated with water in areas surrounding glaciers at high elevations.



SOLIFLUCTION AND CREEP

- ✘ Solifluction occurs in arctic (tundra) climates where the subsoil is permanently frozen. In the spring and summer, only the top layer of soil thaws.
- ✘ Solifluction can also occur in warmer regions, where the subsoil consists of hard clay.

SOLIFLUCTION AND CREEP

- ✘ **Creep:** the slow downhill movement of weathered rock material
- ✘ Soil creep moves the slowest of all types of mass movements. But creep may go unnoticed unless buildings, fences, or other surface objects move along with the soil.



ROCKFALLS AND LANDSLIDES

- ✘ The most dramatic and destructive mass movements occur rapidly.
- ✘ The fall of rock from a steep cliff is called a *rockfall*. A rockfall is the fastest kind of mass movement.
- ✘ When masses of loose rock combined with soil suddenly fall down a slope, the event is called a landslide. Heavy rainfall, spring thaws, volcanic eruptions, and earthquakes can trigger landslides

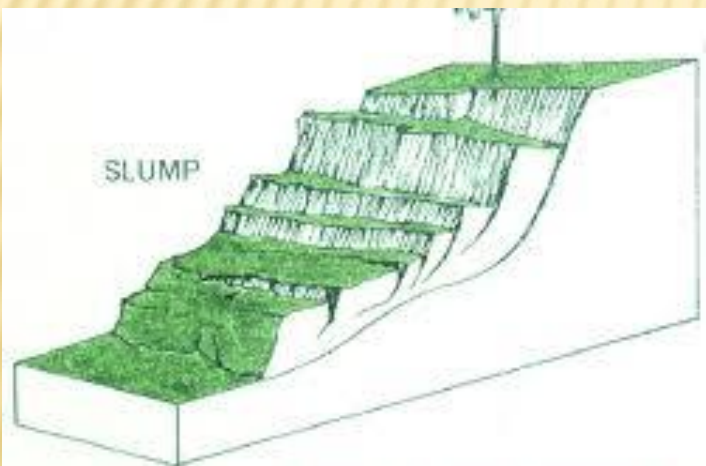


MUDFLOWS AND SLUMPS

- ✘ The rapid movement of a large amount of mud creates a mudflow.
- ✘ Mudflows occur in dry/arid regions during sudden, heavy rainfall or as a result of volcanic eruptions - frequently spreads out in a large fan shape at the base of the slope.

MUDFLOWS AND SLUMPS

- ✘ Sometimes, a large block of soil and rock becomes unstable and moves downhill in one piece. The block of soil then slides along the curved slope of the surface. This type of movement is called a *slump*.
- ✘ Slumping occurs along very steep slopes. Saturation by water and loss of friction within underlying rock causes loose soil to slip downhill over the solid rock.



Coherent or intact masses that move downslope by rotational slip on surfaces that underlie as well as penetrate the landslide deposit

