Chapter 2 Lesson 1: Weathering

Vocabulary

-weathering	-chemical weathering
-mechanical weathering	-oxidation

Weathering and Its Effects

- Weathering: the physical/mechanical and chemical processes that change objects on Earth's surface over time
  - Changes Earth's surface
  - Breaks rock into smaller and smaller pieces, such as sand, silt and clay

Mechanical Weathering

- When physical processes naturally break rock into smaller pieces, mechanical weathering occurs
- Chemical makeup does not change

Causes of Mechanical Weathering	Causes of Mechanical Weathering
Ice Wedging One of the most effective weathering processes is ice wedging—also called frost wedging. Water enters cracks in rocks. When the temperature reaches 0°C, the water freezes. Water expands as it freezes and the expansion widens the crack. As shown in the photo, repeated freezing and thawing can break rocks apart.	**Plants** Plants can cause weathering by crumbling rocks. Imagine a plant growing into a crack in a rock. As the plant grows, its stem and roots not only get longer, they also get wider. The growing plant pushes on the sides of the crack. Over time, the rock breaks.
Abrasion Another effective mechanical weathering process is abrasion—the grinding away of rock by friction or impact. For example, a strong current in a stream can carry loose fragments of rock downstream. The rock fragments tumble and grind against one another. Eventually, the fragments grind themselves into smaller and smaller pieces. Glaciers, wind, and waves along ocean or lake shores can also cause abrasion.	**Animals** Animals that live in soil create holes in the soil where water enters and causes weathering. Animals burrowing through loose rock can also help to break down rocks as they dig.

- An example of mechanical weathering is when the intense heat of a forest fire causes nearby rocks to expand and crack.
- When something is broken into smaller pieces, it has a greater surface area.
- Surface area is the amount of space on the outside of an object.

Chemical Weathering

- Chemical weathering changes the materials that are part of a rock into new materials
  - Chemical makeup changes

- Water
  - Most substances dissolve in water
  - Process of dissolving breaks up the minerals in the rock into small pieces. These pieces mix with water to form a solution and are washed away from the rock.
- Acids
  - Cause more chemical weathering than pure water does.
    - Chemical weathering happens faster
  - Lower pH than water – means the acids are more acidic than water
- Oxidation combines the element oxygen with other elements or molecules.
  - Product of oxidation is called an oxide
  - When rocks that contain iron oxidize, a layer of iron oxide forms on the outside surface (exposed to the air)

What affects weathering rates?

- The environment
  - Mechanical weathering fastest in locations that have a lot of temperature changes
  - Chemical weathering fastest in warm, wet places
- Type of rock
  - Hard or soft rock
  - Size and number of holes in rock

Chapter 2 Lesson 2: Soil

Vocabulary

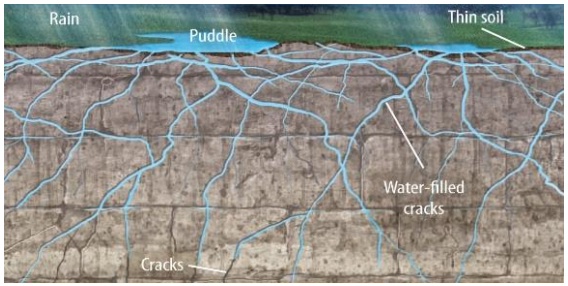
-soil	-decomposition	-topography
-organic matter	-parent material	-biota
-pore	-climate	-horizon

What is soil?

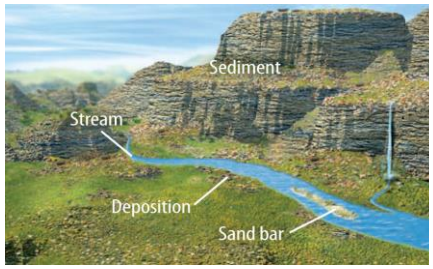
- Soil is a mixture of weathered rock, decayed organic matter, mineral fragments, water, and air
- Organic matter is the remains of something that was once alive
  - Decomposition is the process of changing once-living material into dark-colored organic matter
- Soil contains gases that fill the soil pores – the small holes and spaces in soil
  - The sizes of pores change with differences in particle size
    - Small pores retain more water in the soil

Formation of Soil

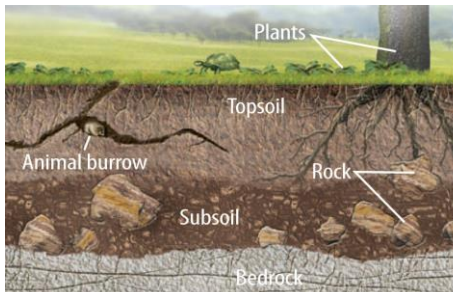
- Inorganic matter in soil is formed by the mechanical and chemical weathering of rocks into fragments
- Inorganic means materials that have never been alive
- Parent material is the starting material of soil
  - Parent material is made of rock or sediment that weathers to form the soil



- The average weather of an area is its climate
- If the parent material is in a warm, wet climate, soil formation can be rapid
- Topography is the shape and steepness of the landscape
  - Determines what happens to water that reaches the soil surface
  - Water running downhill can carry soil with it, leaving some slopes bare of soil



- Biota is all of the organisms that live in a region
  - Biota in soil help speed up soil formation in many ways
    - Decomposition of matter
    - Form passages in soil for water to move through
  - Rock and soil are affected by organism activity
  - Mature soils develop layers as new soil forms on top of older soil



Horizons

- Weathering is always happening, making soil formation a constant but slow process
- Horizons are layers of soil formed from the movement of the products of weathering
- Characteristics of each horizon depends on the materials it contains
- Three horizons common to most soils are:
    - A-horizon: what you see when you dig a shallow hole, lots of organic matter so usually dark, good for plant growth
    - B-horizon: formed by clay that is carried down by water through pores in the A-horizon
    - C-horizon: layer of weathered parent material (rock or sediments)
- The top, organic layer is called the O-horizon and the unweathered, bedrock layer is the R-horizon

Soil Properties and Uses

Soil Properties	
Color	Soil can be described based on the color, such as how yellow, brown, or red it is; how light or dark it is; and how intense the color is.
Texture	The texture of soil ranges from boulder-sized pieces to very fine clay.
Structure	Soil structure describes how the particles are held together. Structure can be grainy, blocky and even prism shaped.
Consistency	The hardness or softness of a soil is the measure of its consistency. Consistency varies with moisture. For example, some soils have a soft, slippery consistency when they are moist.

Soil Properties	
Infiltration	Infiltration describes how fast water enters a soil.
Soil moisture	The amount of water in soil pores is its moisture content. Soil scientists determine soil moisture by drying samples in an oven at 100°C.
pH	Most soils have a pH between 5.5 and 8.2. Soils can be more acidic in humid environments.
Fertility	Soil fertility is the measure of the ability of a soil to support plant growth. Soil fertility includes the amount of certain elements that are essential for good plant growth.
Temperature	On the ground surface, soil temperature changes with daily cycles and the weather. Soil temperature in lower layers changes less.

- Some properties of soil can be determined just by observation
- The amount of sand, silt, and clay in a soil can be estimated by feeling the soil
- Many soil properties can be measured more accurately in a laboratory
- Laboratory measurements can determine exactly what is in each sample of soil
    - Helps determine if the soil is suitable for farming or gardening
- Plants depend on nutrients from organic matter and the weathering from rocks
    - Plant growers can observe how well plants grow in the soil to get information about soil nutrients
- It takes thousands of years to form soil from parent material. Soil that is damaged is slow to replenish nutrients
    - Can take many human lifetimes

The type of soil formed depends partly on climate