Weathering

• Weathering results in breaking down rock

• Two Types of Weathering:
  1. Mechanical Weathering
  2. Chemical Weathering
Mechanical Weathering

- **Ice** The alternate freezing and thawing of soil and rock, is called frost action.

- **Abrasion** the grinding and wearing away of rock surfaces through other rock or sand particles rubbing against it.

- **Wind, Water, and Gravity** carry rocks, causing them to scratch against one another.
Mechanical Weathering

- **Plants** the force of the expanding root can break a rock apart.

- **Animals** Almost any animal that burrows causes mechanical weathering by mixing and digging through soil and rock particles.
Chemical Weathering

• **Water** Even hard rock, such as granite, can be broken down by water.

  ![Chemical Weathering of Granite](image)

  1. Rain, weak acids, and air chemically weather granite.
  2. The bonds between mineral grains weaken as weathering proceeds.
  3. When granite is weathered, it makes sand and clay, also called sediment.

• **Acid Precipitation** The high level of acidity can cause very rapid weathering of rock.
Chemical Weathering

• **Acids in Groundwater** When acidic groundwater comes into contact with limestone, the limestone is dissolved.

• **Acids in Living Things** Some living things, such as lichens, produce acids that can slowly break down rocks.

• **Air** Oxygen in the air causes oxidation. Oxidation is the chemical reaction in which an element, such as iron, combines with oxygen to form an oxide.
Differential Weathering

- Softer, less weather resistant rock wears away and leaves harder, more weather resistant rock.
Effecting the Rate of Weathering

- **Time Exposed on Surface:**
  - Old unexposed rocks – no big changes
  - New exposed rocks – weather quickly

- **Rock Composition:** different rocks weather differently
  - Stable rock resists chemical weathering

- **Climate**
  - Ex: limestone ok in warm/dry climate; when wet, weak acids weather
Effecting the Rate of Weathering

- **Surface Area**: when a rock is in small pieces, more surface area is available for weathering.

- **Topography**: materials on slopes are more likely to move due to gravity.
  - This exposes underlying rock, giving more opportunities for weathering.
Total Surface Area to Volume

1. All cubes have both volume and surface area. The total surface area is equal to the sum of the areas of each of the six sides, or the length multiplied by the width.

2. If you split the first cube into eight smaller cubes, you have the same amount of material (volume), but the surface area doubles.

3. If you split each of the eight cubes into eight smaller cubes, you have 64 cubes that together contain the same volume as the first cube. The total surface area, however, has doubled again!
The Source of Soil

- **Soil**: a loose mixture of small mineral fragments, decaying organic matter (humus), water, and air that can support the growth of vegetation.

- **Two Types of Soil**:
  - **Residual** soil that remains above its parent rock
  - **Transported Soil** soil that is blown or washed away from its parent rock by erosion
Properties of Soil

- **Texture** soil quality that is based on the proportions of soil particles.
- **Structure** the arrangement of soil particles.
Properties of Soil

- **Soil Fertility** A soil’s ability to hold nutrients and to supply nutrients to a plant.

- **Soil Horizons** A series of layers in the soil due to the way it forms.

- **Soil pH** Soils can be acidic or basic. The pH scale is used to measure how acidic or basic a soil is.
Soil Texture

- Texture of a soil affects its ability to keep in moisture and support plant growth.
- To determine texture, find the intersection of its percent sand, silt, and clay.
The Importance of Soil

- **Nutrients** Soil provides minerals and other nutrients for plants. All animals get their energy from plants.

- **Housing** Soil provides a place for animals to live.

- **Water Storage** Without soil to hold water, plants would not get the moisture or the nutrients they need.
Soil Composition

- **Soil Forms in Layers** during the process of its development

- **Parent Rock**: the solid bedrock from which weathered pieces of rock first break off
Soil Profiles

- **Soil Profile**: a vertical sequence of soil layers

- **Soil Horizon**: a distinct layer within a soil profile
  - Three major soil horizons: A, B, and C
  - **Horizon A**: Topsoil; has high concentrations of humus and clay
  - **Horizon B**: has subsoils enriched with clay minerals washed down from A
  - **Horizon C**: directly above solid bedrock, contains weathered parent material
**Draw Me!**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Depth</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6-12″</td>
<td>topsoil</td>
</tr>
<tr>
<td>B</td>
<td>12-36″</td>
<td>subsoil</td>
</tr>
<tr>
<td>C</td>
<td>1-many feet</td>
<td>parent material</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>bedrock</td>
</tr>
</tbody>
</table>

The diagram illustrates a plant with its roots extending into the soil layers labeled A through D. The labels topsoil, subsoil, parent material, and bedrock correspond to layers A, B, C, and D, respectively. The depth ranges for each layer are indicated, with A ranging from 6 to 12 inches, B from 12 to 36 inches, C as 1-many feet, and D reaching bedrock.