

## Sediments versus Soil - What's the Difference?

### SEDIMENTS

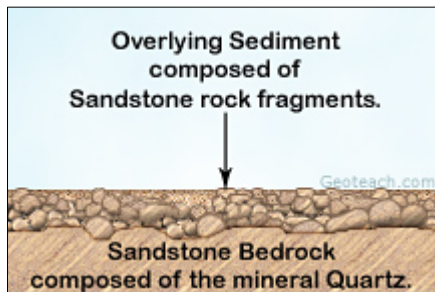


#### Composition of Sediments:

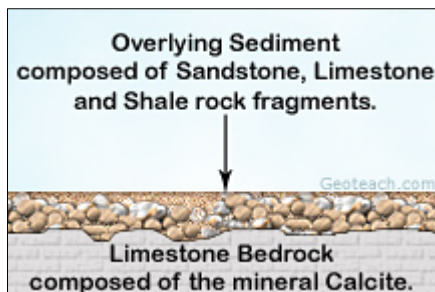
#### Weathered Rock Fragments

Sediments are composed of parent material consisting of underlying bedrock and/or transported rock material that has disintegrated over time.

The composition of the sediments may match the bedrock below.



Or, erosional agents, such as running water, wind, glaciers or gravity may have transported them great distances in which case, upon their deposition, the composition of sediments will differ from the surrounding bedrock.



### SOIL



#### Composition of Soil:

#### Sediments

Weathered rock fragments, or sediments, are the foundation of soil formation. Particle sizes may range from clay to pebbles and vary in mineral composition. Sediments alone do not make soil however, when combined with the other "ingredients" listed below, they are an essential part soil composition.

*Residual Soil:* The composition of the sediments in soil matches that of the surrounding bedrock.  
*Transported Soil:* Erosional agents may have transported sediments great distances in which case, upon their deposition, the composition of sediments, and therefore developing soil, will differ from the surrounding bedrock.

#### Humus - Organic Matter

Humus is organic material that is stable and which will not break down any further over time. It is most prevalent on the floors of densely forested areas where vegetation is abundant. Organic material within soil comes from decomposing plants and animals, the waste products of living organisms and the biologic activity of earthworms, microorganisms and fungi.

**Composition of Soil continued:**

**Nutrients**

Nutrients are added to soil by decomposing or decaying organisms, as well as through the waste products (excretion) from all living organisms. Earthworms and microscopic bacteria assist in the decomposition of organic matter recycling nutrients and enriching the soil.

**Oxygen**

Oxygen is present in pore spaces between soil sediments. Earthworms, and other burrowing animals, assist in aerating soil which allows for an increased capacity to store oxygen between soil particles.

**Water**

Solid bedrock may be impermeable thus not allowing water to neither pass through nor store within it. Sediments and the soil they comprise, however, are porous and permeable. Water can be stored within and move through the spaces between fragments. Depending upon the shapes and sizes of the individual fragments within a soil layers, degrees of porosity and permeability exist. Soil suitable for supporting abundant life, must contain water as part of its composition.

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## Factors Affecting Soil Development



### Availability of Weathered Sediments



Weathered rock fragments are the building blocks of soil. The mineral composition of bedrock determines the composition (soil type) that forms above it. Residual soil, (soil that remain in place and which is not moved by an agent of erosion) has a composition that matches the underlying bedrock from which it formed. Solid bedrock must weather into smaller sediments that will eventually comprise loose soil layers. Transported sediments may also add to the rocky material in a given location. Agents of erosion such as running water, wind and glacial ice can bring sediments from distant locations then deposit them to be further weathered and broken down into soil particles.



### Abundance of Organic Matter



Life and life by-products (waste) are a distinguishing factor between layers of ordinary sediments and rich soil. Organic material is critical to the formation of humus and nutrient-rich topsoil, essential for growth of area vegetation. Organisms both living and dead contribute essential organic matter to soil. Decomposition plays an important role in soil formation but so does the life process of waste elimination. Microorganisms, such as bacteria, that live within the soil assist in decomposing organic material. Acids secreted by microorganisms and fungi can break down rock material as well. Some species of **Lichens** are both photosynthetic and parasitic and they are capable of chemically dissolving and degrading rock material thus contributing to the weathering process. Vegetation plays a critical role in the formation of thick, rich soil and regions with a scarcity of plant life, such as deserts, will have little or no distinct soil layers capable of supporting abundant life. Decaying plant matter is an essential component of a thick, well-developed soil profile in that, without this contributing factor, the uppermost nutrient-rich, life sustaining layers of topsoil and humus will not form.



### Climate



Climate is an extremely important factor in soil formation as well as how quickly soil horizons develop. Climate of a region directly affects rates of bedrock weathering and erosion. Abundant precipitation increases weathering rates and allows for more infiltration of water into soil layers. In more humid regions running water allows for greater sediment transport and deposition, the basis for the rocky material which will weather into soil layers. Vegetation in such areas is also more plentiful and the accumulation and decomposition leaves and other plant material contribute organic material and nutrients to upper soil layers. Warmer climates favor faster weathering rates than do cooler climates. This holds true whether or not an area is dry or humid. Rocks weather faster in climates that are hot and humid than they do in climates that are cold and humid.



One inch mature soil can take hundreds of years to develop. A mature, well-developed soil profile with distinct horizons may take hundreds of thousands of years to form. In hot and humid climates a soil profile will develop faster than in a cold, humid climate. Well-developed soil layers may never develop in regions that are extremely arid. Arid regions also lack abundant vegetation necessary for a rich topsoil to develop.

### Topography

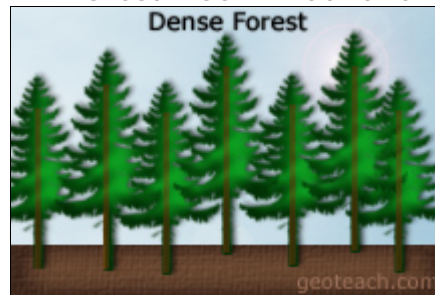
#### **Steeply Sloped Land**



Steep slopes facing the sun are warmer. Conditions favor desiccation of sediments which makes them more vulnerable to agents of erosion, especially wind.

On steeper slopes rain fall and subsequent runoff transports sediments and organic matter down hill. Soil formation on slopes is limited while accumulation of this material, and subsequent soil development, is favored in the valleys below.

#### **A Forest Floor - Flat Land**



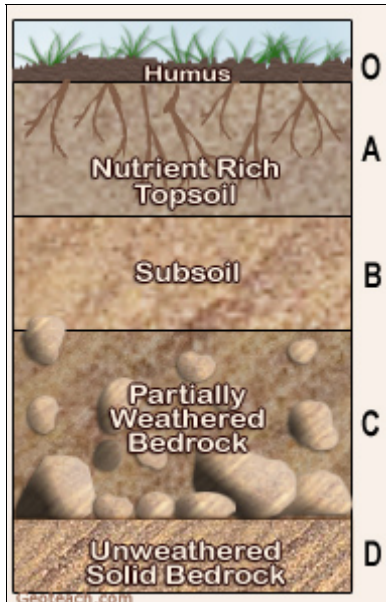
Floors of densely forested areas provide the most suitable environment for soil layers to develop. Flatter topography limits erosion while plant matter that falls to the ground accumulates and decomposes, enriching the upper soil layers, allowing thick humus and topsoil to form. Abundant life adds to soil nutrients through both decomposition and the elimination of waste products.

#### **Valley**



## A Soil Profile

### Profile of Mature, Well-Developed Soil



**O Horizon** – This horizon is found mainly as the top layer in heavily forested areas where leaves along with animal and insect remains decompose on the forest floor. Rich in nutrients, this layer is very dark in color and it is not found in all soil profiles.

**A Horizon** - This top layer of a Soil Profile is commonly referred to as *Topsoil*. Also dark in color, it is composed of minerals from weathered bedrock below as well as organic remains from the decomposition of vegetation and animals. Roots of the majority of vegetation extend into this layer.

**B Horizon** - Percolating water that passes through the upper soil layers carries nutrients into this horizon where they then accumulate. The B Horizon is lighter in color, often yellowish or even stained red due to the accumulation of iron oxides leached from the upper layer(s). Clay, aluminum and iron are commonly present in this zone but organic remains are not commonly found at this location.

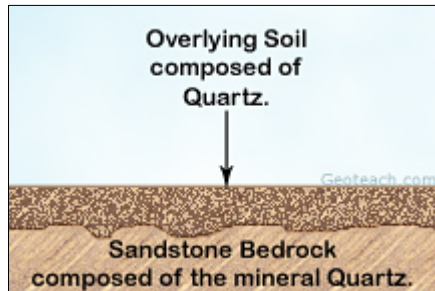
**C Horizon** - This layer includes partially weathered bedrock. It may derive exclusively from the subsurface bedrock below but it may also contain transported deposits brought to the area by running water, wind, volcanic activity or glaciers.

**D Horizon** - This layer is the unaltered, unweathered subsurface bedrock at the bottom of the Soil Profile.

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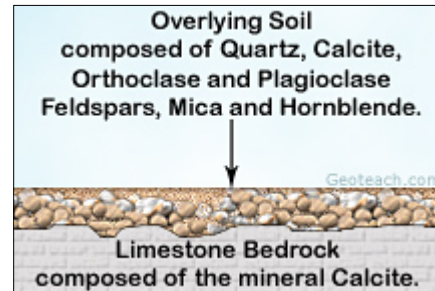
## Residual versus Transported Soil

### Residual Soil



The mineral composition of *Residual Soil* matches that of the bedrock below.

### Transported Soil



The mineral composition of *Transported Soil* does not match the mineral composition of the bedrock below. The Soil was moved from a different location by an agent of erosion, i.e. transport.

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***Soil may have been transported by one or more of the following agents of erosion:***

- Running Water
- Wind
- Glacial Ice
- Gravity
- Human Activity

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- [Residual versus Transported Soil](#)
- [Soil Formation](#)