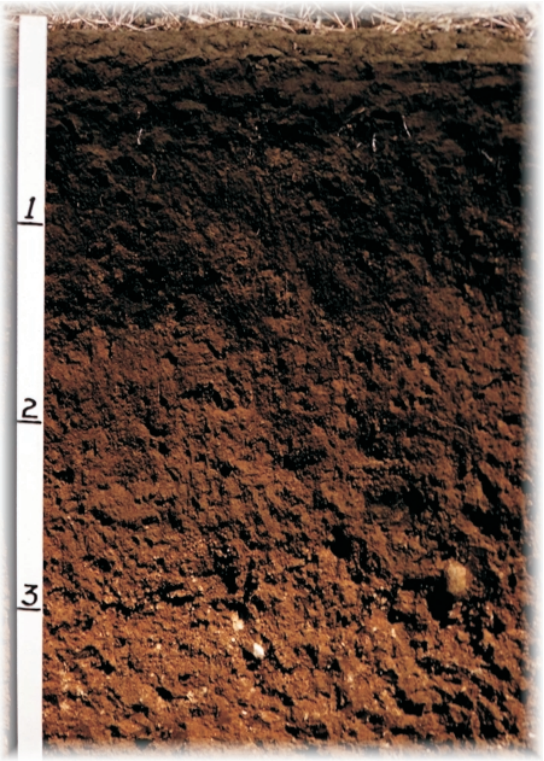
Explaining a Soil Profile

HAVE YOU NOTICED at construction sites how a cross section of soil has a layered look? Soil near the top of the cross section is often dark, and soil below appears lighter. What you have seen is a soil profile. In this unit, factors that contribute to the layered look you have seen will be discussed.



(Courtesy, Natural Resources Conservation Service, USDA)

Objective:

Explain the soil profile.

Key Terms:

addition
eluviation
illuviation
loss
soil horizons
soil profile
solum
subsoil
substratum
topsoil
transformation
translocation

Soil Profile

A **soil profile** is a vertical cross section of the soil. When exposed, various **soil horizons**, or layers of soil, become apparent. Each horizon of soil may be different from the other horizons in physical or chemical ways. The differences are developed from the interaction of such soil-forming factors as parent material, slope, native vegetation, weathering, and climate.

A soil profile is usually studied to a depth of 3 to 5 feet. To see the soil profile, soil cores may be taken or holes dug to expose the profile. A soil core or auger allows the extraction of a cylinder of soil for study.

FIGURE 1. Soil profile. (Courtesy, Natural Resources Conservation Service, USDA)

CHANGES TO THE SOIL PROFILE

As a soil ages, horizontal layers develop and changes result. The causes of these changes are classified as four processes. Each process occurs differently at various depths in the soil.

- **Addition**—This process occurs as materials such as fallen leaves, windblown dust, or chemicals from air pollution are added to the soil.
- **Loss**—This process occurs when materials are lost from the soil because of deep leaching or erosion from the surface.
- **Translocation**—This process involves the movement of materials within the soil. It can occur with deeper leaching into the soil or with upward movement caused by evaporating water.
- **Transformation**—In this process, materials are altered in the soil. Examples are organic-matter decay, weathering of minerals to smaller particles, and chemical reactions.

SOIL HORIZONS

There are three primary soil horizons, called master horizons. They are *A, B,* and *C.* These are part of a system for naming soil horizons in which each layer is identified by a code: *O, A, E, B, C,* and *R.*

The *O* horizon is an organic layer made up of partially decayed plant and animal debris. It generally occurs in undisturbed soil, such as in a forest.

The *A* horizon is often referred to as the **topsoil** and is the surface layer where organic matter accumulates. Over time, this layer loses clay, iron, and other materials because of leaching. The movement of organic matter, chemical substances, and mineral particles from the upper horizons of soil to the lower horizons by the downward movement of water is called

ON THE JOB...

CAREER CONNECTION: Soil Scientist

Soil scientists study the chemical, physical, biological, and mineral characteristics of soil. Their study of the soil is frequently associated with plant growth. The work of a soil scientist might include the responses of various soil types to fertilizers, soil composition, and drainage patterns. Soil scientists are called upon to provide information and recommendations to nursery owners and operators regarding the best use of land, plant growth, and soil erosion. Application of precision technologies has grown in importance for practicing soil scientists.

A soil scientist generally pursues an associate's or baccalaureate degree in soil science. Many soil scientists obtain further formal education through postgraduate studies.

Numerous career opportunities are available with government agencies conducting soil surveys and classifying and mapping soils. Private industry also provides opportunities for qualified individuals.

(Courtesy, Natural Resources Conservation Service, USDA)

eluviation. The *A* horizon provides the best environment for the growth of plant roots, microorganisms, and other life.

The *E* horizon is the zone of greatest eluviation. Because the clay, chemicals, and organic matter are leached, the color of the *E* horizon is very light. This horizon usually occurs in sandy forest soils with high amounts of rainfall.

The *B* horizon is often referred to as the **subsoil**. It is often called the "zone of accumulation" because chemicals leached from the *A* and *E* horizons accumulate here. The accumulation of organic matter, chemical substances, and mineral particles in the lower horizons of soil from the upper horizons as a result of the downward movement of water is called **illuviation**. The *B* horizon has less organic matter and more clay than the A horizon. Together, the *A, E,* and *B* horizons are known as the **solum**. This is where most of the plant roots grow.

The *C* horizon is called the **substratum**. It lacks the properties of the *A* and *B* horizons because it is influenced less by the soil-forming processes. It is usually the parent material of the soil.

The *R* horizon is the underlying bedrock, such as limestone, sandstone, or granite. It is found beneath the *C* horizon.

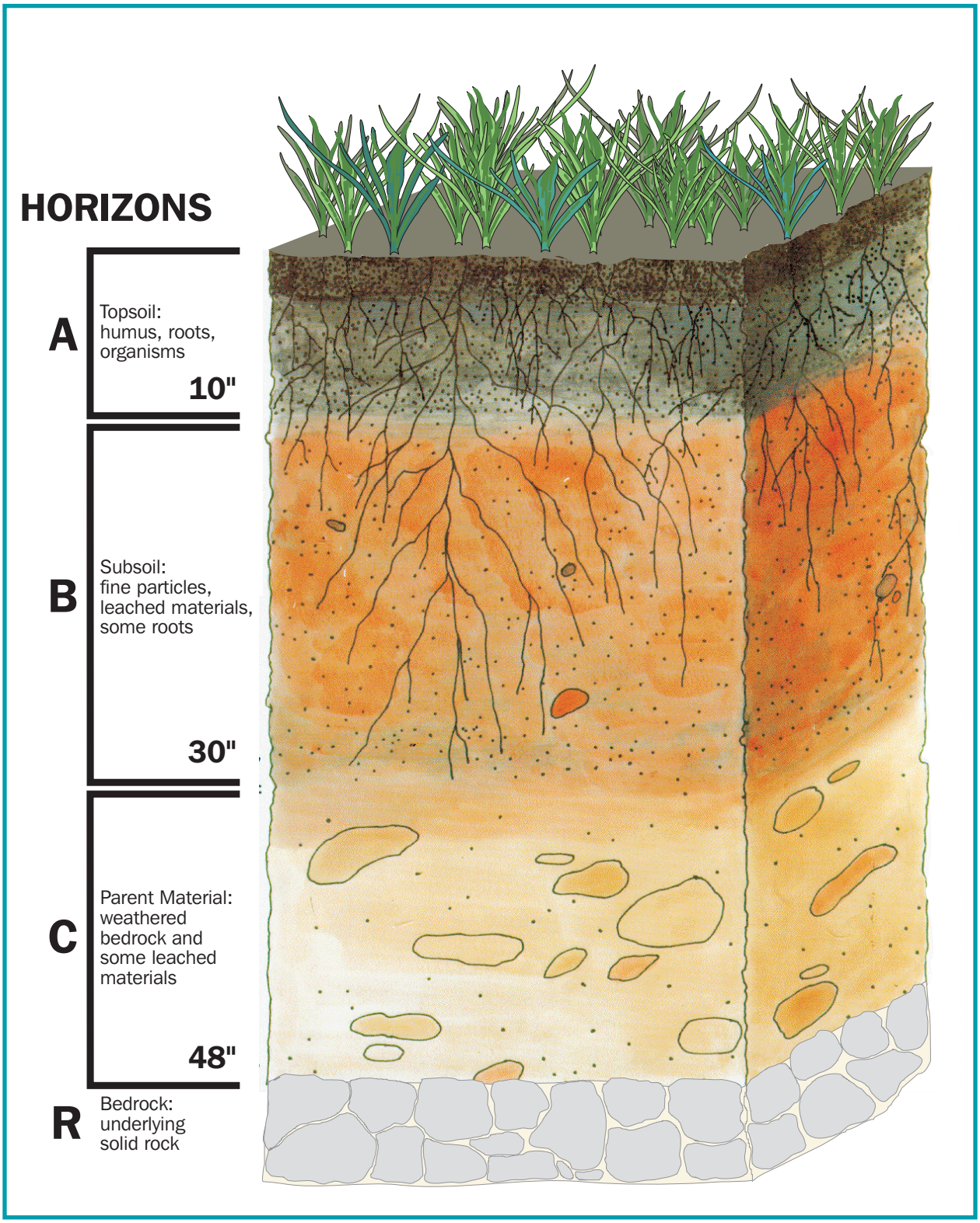


FIGURE 2. Diagram of a soil profile.

Summary:

A soil profile is a vertical cross section of the soil. The differences are developed from the interaction of such soil-forming factors as parent material, slope, native vegetation, weathering, and climate.

As a soil ages, horizontal layers develop and changes result. The causes of these changes are classified as four processes: addition, loss, translocation, and transformation.

There are three primary soil horizons, called master horizons. They are *A, B,* and *C.* These are part of a system for naming soil horizons in which each layer is identified by a code: *O, A, E, B, C,* and *R.* The *A* horizon is often referred to as the topsoil The *B* horizon is often referred to as the subsoil. The *C* horizon is called the substratum.

Checking Your Knowledge:

1. What is a soil profile?
2. What factors are involved in the development of soil profiles?
3. What are the four classes of changes to soil horizons?
4. What are the master horizons?
5. How do eluviation and illuviation differ?

Expanding Your Knowledge:

Participate in a soils career development event with your classmates. Apply your knowledge of soil profiles during the competition. An alternative is to dig a hole several feet deep into a soil that has not been disturbed. Study the profile of the soil and identify the horizons.

Web Links:

Soil Profiles

https://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/soil_systems/soil_development_profiles.html

Soil Horizons

http://serc.carleton.edu/NAGTWorkshops/visualization/collections/soil_horizons.html

Soil Layers

http://www.petrik.com/PUBLIC/library/misc/aw5_s_layers.htm