Video Guide: Importance of Soil

1. Describe in what ways soil is a medium for plant growth.

Soil holds water and nitrogen-fixing bacteria, as well as supplying mineral and water to plant roots. Soil also gives plant roots something to anchor into.

2. Identify the percentage of oxygen and carbon dioxide can be found above and below the soil.

Oxygen concentration is 21% above ground, and somewhere between 21-0% under the soil. CO2 concentrations above ground are 0.03%, while under soil it can be 0.03%-21%.

3. Describe the components of the soil in the three-phase system.

Solid particles are the sand, silt, clay, and various organic and mineral particles. Overall, this accounts for roughly 50% of soil volume.

Pore spaces can be macropores or micropores. Macropores allow for air and water to move through the soil relatively easily. Micropores hold water in the soil, keeping it where plants can use it. These account for 20-30% of soil volume.

Liquids or water is the last component, accounting for the remaining 20-30%.

4. Describe how annual crops, perennial forages, and perennial horticultural crops affect the soil.

   Typically, annual crops require the soil to be prepared for growing every year and can lead to erosion. Perennial crops control weeds, reduce erosion, prevent the soil from being compacted, and regulate the amount of organic matter. Perennial forage plants like alfalfa have a tendency to improve soil health.

5. Describe the benefits of soil for each nonagricultural use.

Certain soil properties such as load-bearing capacity and shrink-swell potential matter for engineering jobs where it needs to be certain that the soil can support whatever is being built.

Soil microbes break down organic waste, and it's the main way landfills process trash.

Natural spaces like parks need healthy soil to maintain plant life.

Soil is used to make adobe, a building material.

6. List the ways that soil degradation can cause the loss of soil quality.

Poor soil health can lead to desertification, salinization, erosion, decrease in biomass, and other changes to the soil chemistry.

7. Describe how soil plays a critical role in natural ecosystems.

Soil properties such as hydration, nutrient density, and temperature dictate what species can live in an area.

8. Describe how organic matter and climate change are connected.

Organic matter in soil sequesters huge amounts of carbon. When soil degrades and loses organic matter, more CO2 that would be sequestered is released to the atmosphere.

Questions that make you think:

1. In older homes, tile sewer lines have openings that are often invaded by tree roots, plugging the lines. Explain why this happens.

As the pipes age, they rust and begin to weaken or form holes. Any cracks or holes that form in the pipes can be grown into by roots in the soil. As the roots continue to grow, they can block the pipe.

2. In building a home, an old tree has its roots covered with an additional foot of soil to make a flat, level area for a patio; the tree slowly dies. Explain why the tree died.
   The additional soil likely compacted the soil and made it less permeable. This would reduce the ability of the soil around the roots to exchange gases with the atmosphere and lead the soil to intake less water. This is especially true if there's a patio on top.

3. Traditionally, landscapers mulched shrub beds by covering the soil with a sheet of black plastic and then laying a mulch such as rock chips on top. Now, they have mostly replaced the black plastic with porous landscape fabrics. Explain the advantage of the fabrics to shrub health.

Fabrics are water permeable while a sheet of plastic is not. An impermeable sheet over a shrub's roots is going to mean the soil doesn't absorb water directly and its ability to exchange gas with the atmosphere is impaired. Fabrics solve both of these issues while still blocking light to the soil to prevent weed growth.

4. Corn prices are high this year, so a farmer plows up an old pasture and plants it with corn. As a consequence, the organic matter content of the soil declines. Explain why this would contribute (in a very small way) to an increase in average global temperatures.
   The decrease in organic matter content of the soil harms the pasture's ability to sequester carbon. As the soil is tilled, some amount of the stored carbon will be released.