

## 1.9: Soil

Have you ever noticed the colour of the water in a river or stream after a heavy rainfall? What do you think caused this change in colour? Soil has been washed into the river from the riverbank or from nearby fields. This soil is no longer available for growing plants. A thin layer of soil, usually less than 2 m thick, provides the nutrients necessary for all the plants that grow in it. Entire civilizations have disappeared because topsoil was lost.

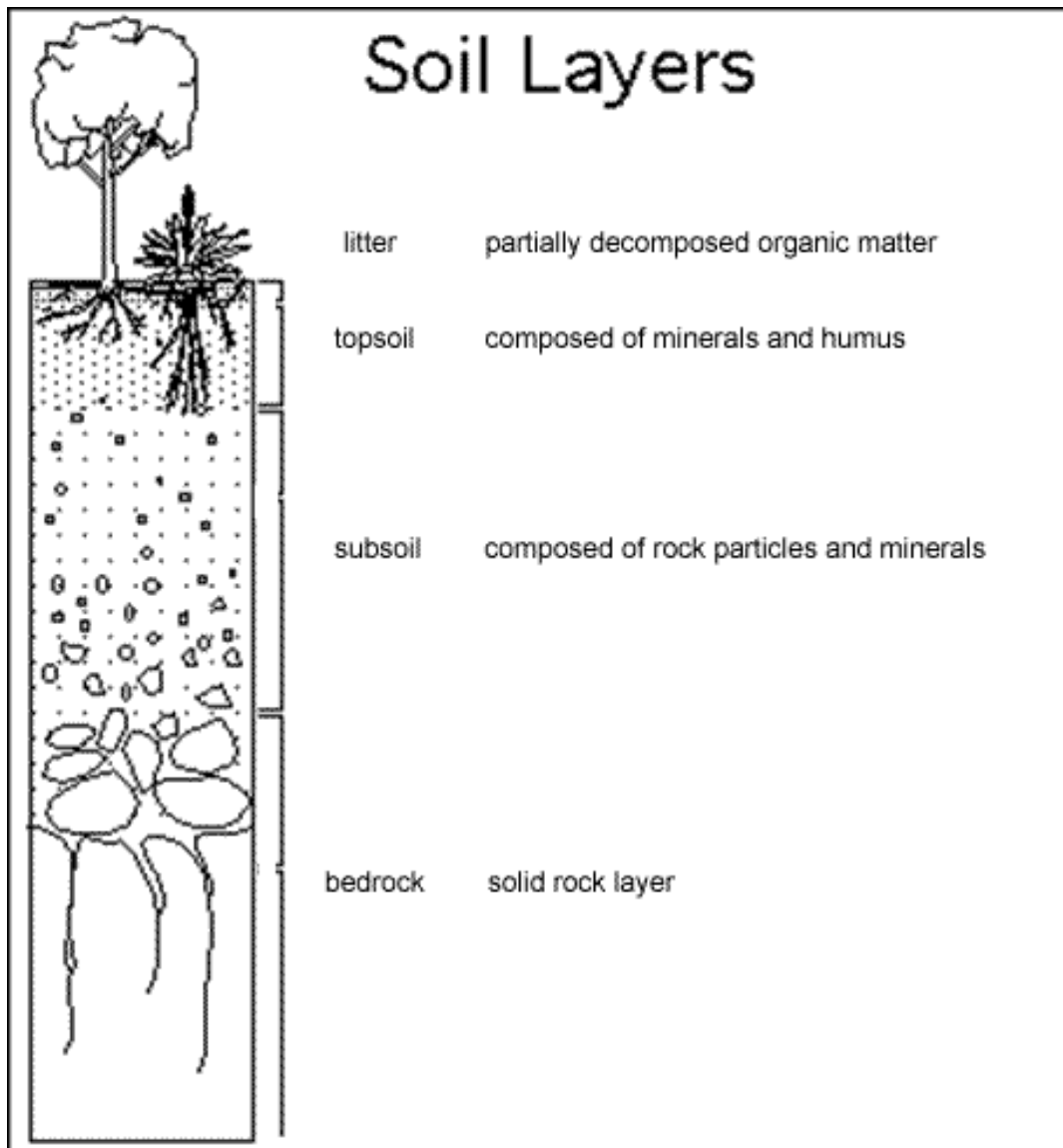


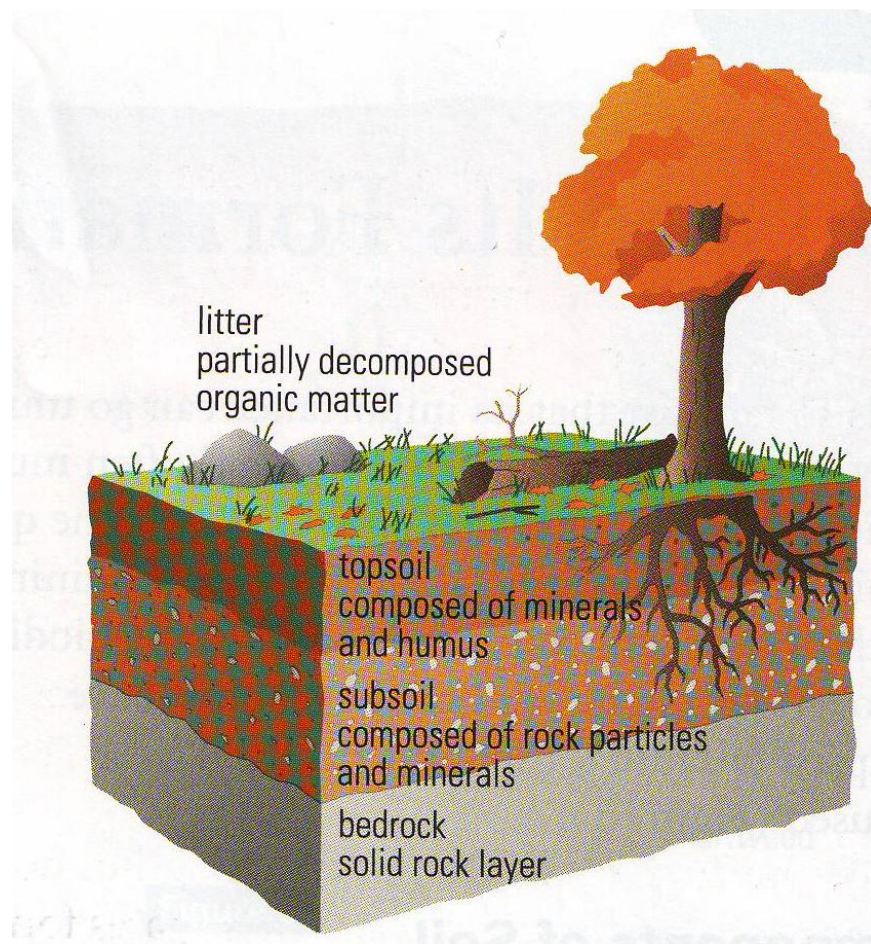
### Components of Soil

Soil is made up of a number of layers, each having its own distinctive colour and texture.

The upper layer is known as the litter. It acts like a blanket, limiting temperature variations and reducing water loss. The topsoil layer is made up of small particles of rock mixed with decaying plant and animal matter called humus. Humus is black and gives the topsoil its dark colour and odour. This layer is usually rich in nutrients, oxygen, and water. If oxygen is present in only small amounts, dead plant material decays slowly and can build up into a layer of peat. Below the topsoil is the subsoil, a layer that contains more stones mixed with only small amounts of organic matter. This layer is lighter in colour because of the lack of humus. Beneath the soil lies a layer of bedrock.

Soil forms from the bottom up. Over time bedrock is attacked by rain, wind, frost, and snow. It is gradually broken down into smaller particles in a process called weathering. Plants begin to grow, and material from their decomposition enriches the topsoil. Most of the soil in Eastern Canada was formed from weathered rock that was exposed when the ice receded 12 000 years ago.

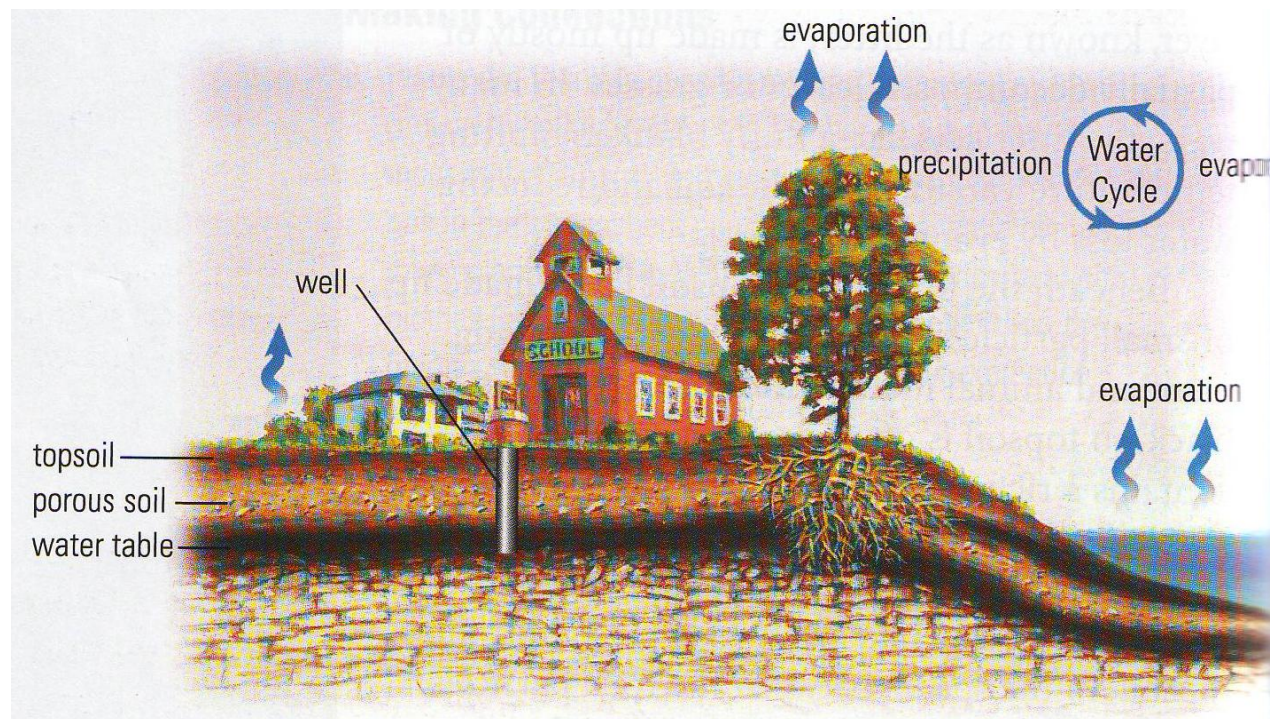




### Water Beneath the Soil

**Surface water** collects and flows above the ground in lakes, ponds, and rivers. Once in the soil or rock, it is called **groundwater**. Gravity pulls groundwater through the soil in a process called **percolation**. Eventually the water reaches a saturated layer called the **water table**. Underneath is bedrock or dense **clay**, through which water cannot percolate.

As water seeps downward, it dissolves organic matter and minerals from the soil and carries them deeper in a process called **leaching**. Leaching is a serious problem because plants require these nutrients for growth.



## Soil pH

Soil can be acidic, neutral, or basic. The pH of the soil is determined by the nature of the rock from which it was formed, and by the nature of the plants that grow and decompose in it.

The acidity of rain and snow can lower the pH of the groundwater that enters the soil. By burning fossil fuels such as coal, oil, and gasoline, humans have been contributing to higher levels of acidity in many soils. When fossil fuels are burned, gases are released into the air and then fall back to earth as acid precipitation (rain, snow, freezing rain, dew). Acid soil increases the problem of leaching, and valuable nutrients move to lower soil levels. As nutrients are removed, soil is less fertile. Plants grow more slowly in acidic soil, and also become vulnerable to diseases.

The pH of the soil determines which plants will grow best. For example, mosses often flourish in acidic soils, whereas prairie grasses prosper in alkaline soils. Most plants thrive in soil with a neutral pH (pH 7).

**Worksheet 1.9: Soil**

1. Distinguish between humus and peat?
2. Why is soil important?
3. Describe the features that distinguish each soil layer from the others.
4. Describe two factors that would alter the amount of ground water in an area.
5. A gardener has been trying to grow a pine tree, without success – every tree he has planted has died. He believes that his soil might be the cause. Identify possible problems, and explain how you might solve them.