

# 2026 LANCASTER COUNTY MIDDLE SCHOOL ENVIROTHON

## SOILS

**SOIL BIODIVERSITY:** The foundation of all-natural living species, soil is life. Did you thank soil for your breakfast, lunch, or dinner today? Whether you had pizza or toast today, wheat was the raw ingredient that was processed into flour to a final product that we ate today. The wheat grew because of a seed that germinated in soil. Soil is a natural, three-dimensional body at the Earth's surface. It is capable of supporting plants and has properties resulting from the effects of climate and living matter acting on parent material as conditioned in the passage of time.

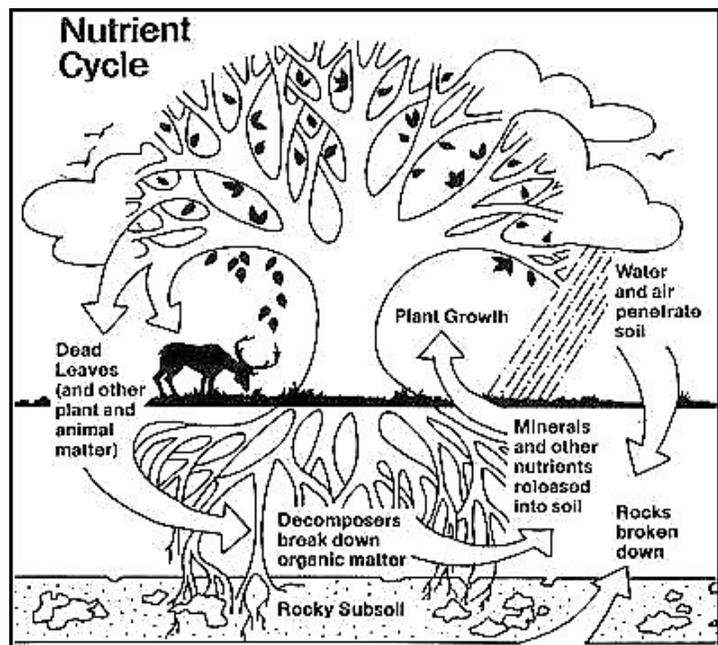


All animals that live in the soil have a job to do, building soil structure, adding to the nutrient cycle, and protecting plants against diseases and pests. In one meter by one meter of soil you can find, 100 species of worms including earthworms and nematodes along with hundreds even thousands of species of bacteria and fungi. The variety and number of creatures that live in the soil is mindboggling.

**SOIL CHEMISTRY:** Organisms that live in soil breathe in oxygen and breathe out carbon dioxide and water vapor just like us. Soils play a critical role in the carbon cycle. Soil chemistry is an important indicator of ecosystem health. For example, one chemical property of soil is its acidity or alkalinity, often stated as pH. Knowing the pH of the soil in your backyard will help you in deciding which trees and plants will thrive in that ecosystem. Soil chemist may research concerns about organic and inorganic soil contamination, pesticides and other pollutants, and environmental health risks. Organic matter are materials composed of decaying plants and animals. They contain many hydrogen and carbon compounds. The formation or arrangements of these compounds can influence the soil's chemistry.

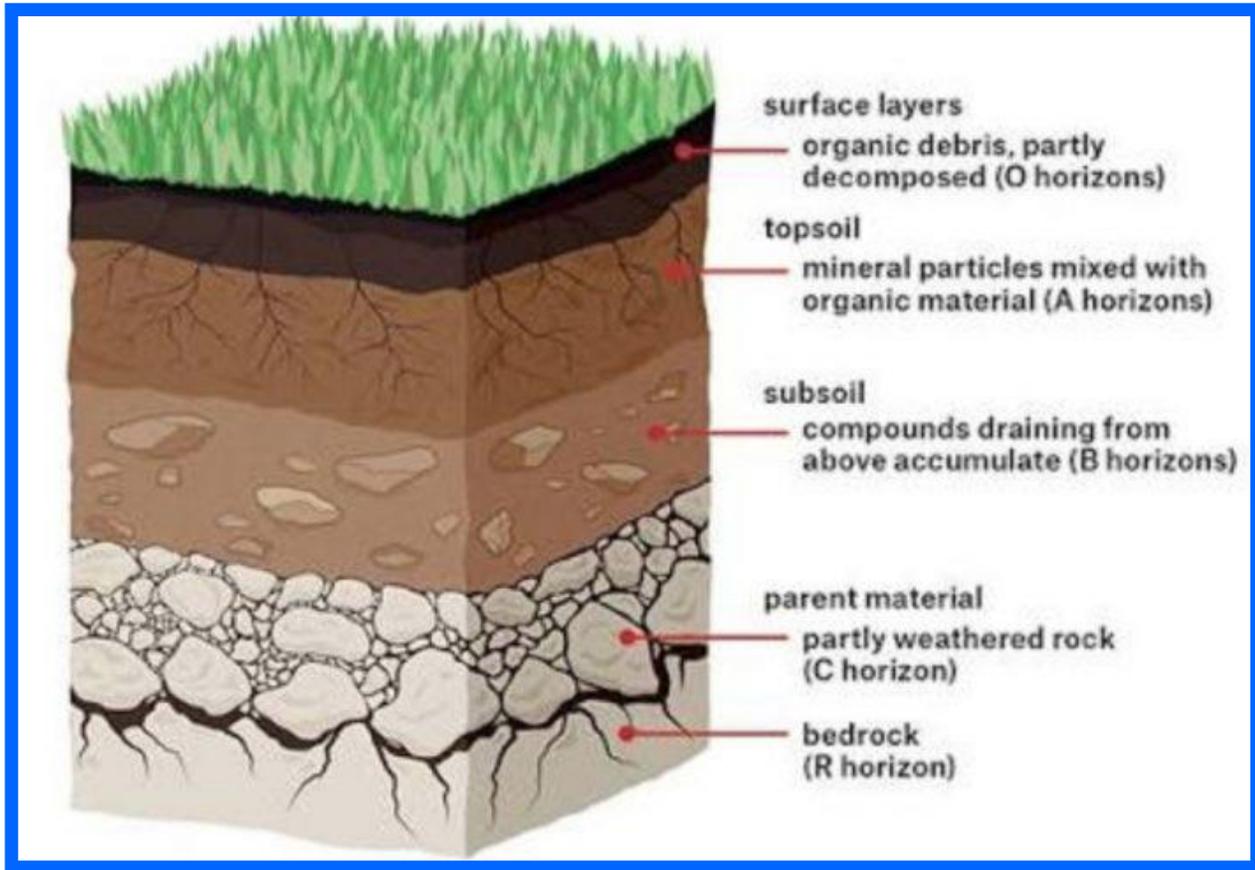
**WHAT IS SOIL HEALTH?** When people grow crops and manipulate soils, soils tend to degrade with time, changing its health. Soil health is the capacity of the soil to function within an ecosystem's boundaries to sustain plant and animal health. Soil health involves physical, chemical, and biological properties. Soil health can improve with conservation practices such as no-till farming, cover crops in fields, and field crop rotations. Backyard habitats with no-mow zones, lawns replaced with native wildflowers, and rain gardens can improve soil health at home.

**SOILS AND PLANTS:** Water absorbed by soil pores from rain and snow is a needed ingredient of plants in soil. Plants produce roots that reach for water in the soil. Plant roots mainly take water in near the tips where there are lots of root hairs. Plants need nutrients just like humans. Plants find nutrients in the soil. Their roots absorb nutrients and then transfer the nutrients to plant parts above ground. Nutrients are constantly recycling between soils and plants. Dead plants fall to the ground and are broken down to release nutrients. If a tree or plant is removed, this recycling is broken as the nutrients travel with the plant. There are 18 different nutrients in the soil that are important to plants.



Plants need a balanced diet of nutrients like human diets to grow properly. Examples of macro-nutrients are nitrogen, calcium, magnesium, and potassium. Examples of micro-nutrients are iron, zinc, copper, and boron.

## SOIL COMPONENTS:



**SOIL pH:** Soil pH is a measure of soil acidity or alkalinity. pH can range from 1 to 14. Values 0-7 is acidic, and 7-14 is alkaline. Soils usually range from 4-10. pH is one of the most important properties

Involved in plant growth, as well as understanding how rapidly reactions occur in soil. For example, the iron becomes less available to plants if the soil's pH is higher. This could create an iron deficiency in the plant. The pH of soil comes from the parent material during soil formation. Soil pH also can affect other living organisms.



The hydrangea plant is common to backyard flower gardens. The plant works like litmus paper as the soil pH determines the color of the flowers on the plant. Acidic soil (pH 4.5–5.5) soils produce blue flowers, and alkaline/basic soil (pH 6.5–7.5+) soils produce pink flowers.

**SOIL TEXTURE:** A handful of soil could feel coarse, smooth, or fine. The feeling comes from the size and particles in the soils. This is known as the soil texture. Soil texture can be determined in a laboratory or estimated in the field. The field method is also called texture by feel. The simple method is to break the soil

into three general groups: sandy, loamy, or clayey. Sandy soils do not form a ball when a moist sample about the size of a cookie dough ball is squeezed in your hand. Loamy soils will form a ball when moist but they will not stick together when you pushed the sample between your thumb and index finger. Clayey soils will also form a ball when moist and will also stick together when pushed between your thumb and index finger.

In terms of particle size, sandy soils are larger than loamy soils and loamy soils are larger than clayey soils. Try the field method with a ball of soil from your backyard and see if you can recognize the different types of soil textures.

**BEDROCK LAYERS:** Lancaster County is known to have two types of bedrock layers: Limestone and Sandstone

Limestone is fairly commonly found in Lancaster County's bedrock, especially through the central part of the county. A sedimentary rock composed of calcium carbonate and magnesium. Limestone is usually gray in color, with white, yellow, and brown marbling. As a bedrock, limestone is erodible and changes due to water amounts and thermal changes underground. A porous rock, limestone absorbs water quickly and can crumble and crack causing sinkholes to form in some landscapes. Limestone has many uses including as a building material, road surfacing, and it is also used to clean water because it is a porous rock.

Sandstone is a sedimentary rock that is more resistant than limestone to weathering. Sandstone is often composed of quartz. It also contains sand grains bound together and may contain silt or clay size particles that occupy the spaces between the sand grains. Sandstone bedrock was formed in many cases by sand near water ways such as the Susquehanna River that was compressed over time forming the bedrock layer. Sandstones can be found in a variety of shades of white, red, green, and gray.

**PENNSYLVANIA STATE SOIL - HAZELTON:** Many states have a designated state bird, flower, fish, tree, mammal, etc. In 1995, Hazelton was named the official state soil of Pennsylvania. Hazelton soil has the most extensive acreage across the state, approximately 1.5 million acres and located in 34 of 67 counties in the state. Water drains quickly through this soil. Hazelton is a sandy loam soil and very stony with a sandstone bedrock. Brown, red, and gray colors favor this soil type. What makes Hazelton soil so important is its use and prevalence in the state. Hazelton soils represent the diversity of Pennsylvania, being used for forestry, agriculture, mining, and communities.

### **SOILS & SOCIETY – Arts, Culture, Literature, Health:**

**Arts:** Most of the materials used in traditional artwork are found in the earth's crust. These include soil for color pigments in paints, dyes, and inks; rocks for sculptures; sand to create glass; ores for metalwork; and clay for ceramics. Soils play a pivotal role. Explore to find a piece of art connected to soil from cave paintings to *Common Ground 191*, a painting by Gary Simpson, who incorporated soils from 192 countries into one painting.

**Culture:** The growing human population around the world puts more stress on the Earth's natural resources. The demand for food, clothing, and shelter puts pressure on soil. Challenges of deforestation (thinning and clearing of forests by humans), desertification (when fertile land becomes a desert as a result of drought, deforestation, or inappropriate agriculture), and salinization (too much salt is added to soils by ocean irrigation, hindering plant growth) are just some of the concerns of today.

**Literature:** Writers have used soil to drive plots and provide a metaphor for a very long time. Isaac Newton, Ben Franklin, Walt Whitman, and Robert Frost used soil in their poetry. Bram Stoker's *Dracula* couldn't rest properly without soil from his Transylvanian home. John Steinbeck gave soil a prominent role in his

book, *The Grapes of Wrath*, set in the Dust Bowl era. Frank Herbert, a science fiction writer was inspired by real life soil scientists when he wrote *Dune*.

Health: Soils have a large number of bacteria and fungi. Researching soils, scientists have developed medicines like antacids and antibiotics. There are also mud therapies that people with diabetes and arthritis have used. The immense diversity of soil micro-organisms and other soil components are still being explored for treating infections, cancer, and even neurological issues.