SOIL CLASSIFICATIONS

Soils can be classified in many ways. Soils are usually defined by a dominant characteristic such as the type of parent material they are derived from, the presence of a certain diagnostic horizon, the climate in which they formed, common vegetation they are associated with, or the amount of weathering they have experienced, among other factors. The United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) classifies soils according to a soil taxonomy that consists of twelve major soil orders, which are displayed on the front of the poster. The World Reference Base for Soil Resources (WRB) suggests classifying soils into 32 reference soil groups (https://soilgrid.org/). Click ‘soil classes;’ then click ‘World Reference Base (2006) Soil Groups.’ There are other classification systems as well. No matter the system, all classification systems help differentiate soils and demonstrate the variety of soil types.

LEARNING ACTIVITIES

1. Examine the front of the poster. Identify your location on the map and see what soil type is shown there. Is that soil order common, or one of the more unique soil orders on the map?


SOIL BASICS

Soil is made of minerals, air, water, and organic matter; it is a living, dynamic resource which is different than dirt (a loosely, out of place mixture). There are different types of soils depending on the climate of the location, Organisms in the soil, the Relief (slope) of the land, Parent material, and the length of Time they have had to develop. CLORPT is short for soil. Soil is different around the world, and even within a backyard. Soil also changes over time. Water, wind, ice, the sun, and organisms transform the soil from its parent material into something that is often quite different.

Soil is made of layers, or horizons. When viewed from the side, these horizons are found one on top of the other and together they form a soil profile. This profile tells a story about the life of a soil, much like a biography. On the front of the poster there are examples of five soil profiles.

In addition to different horizons, soils have other characteristics that distinguish them from one another – texture, structure, and color. The texture is a measure of how much sand, silt, and clay is contained in a soil. The structure of a soil relates to how the particles fit together to form larger clumps of soil called aggregates. The color of a soil is related to the mineral content of the soil and can also give information about how it behaves (for example, a soil that drains well is likely to be brightly colored).

Learning Activities:

1. What observations can you make about each profile? Collect a soil sample and investigate its texture, which is a measure of the sand, silt, and clay content of the soil. SSSA has a qualitative method to determine a soil’s texture by feel (https://bit.ly/texturewell). SSSA also has a quantitative way to determine the sand, silt, and clay contents of your soil (https://bit.ly/SSTexturePlans).

2. Consider what soil is made of and how it develops. How do the Earth systems (the atmosphere, geosphere, biosphere, and hydrosphere) play a role in soil formation and development? AGI’s Earth systems diagram can be used to organize your thoughts (www.americangoesoa.com/sites/default/files/education-systems-Diagram.pdf).

SOILS CLASSIFICATIONS

Geologic mapping is a scientific and technical process that produces maps for many applications, including investigations of geologic hazards, groundwater, energy, and mineral resources; land management; and site planning. Geologic mapping is a science that helps geologists and other professionals understand how rocks and minerals were formed, as well as their location. Geologic mapping is also used to create geologic maps for many applications, including investigations of geologic hazards, groundwater, energy, and mineral resources; land management; and site planning. Geologic mapping is a science that helps geologists and other professionals understand how rocks and minerals were formed, as well as their location. Geologic mapping is also used to create geologic maps for many applications, including investigations of geologic hazards, groundwater, energy, and mineral resources; land management; and site planning.

SOILS ROLE IN CARBON SEQUESTRATION IN AGRICULTURAL LANDS

Soils naturally contain carbon as organic matter (residue from decaying plants and animals) and inorganic matter (weathered rocks and minerals). They have the ability to capture and store carbon dioxide (CO₂) from the atmosphere, processes called carbon sequestration, by the uptake of atmospheric CO₂ by plants through photosynthesis. This CO₂ is converted to organic forms of carbon and stored in plants, which are eaten by animals. Eventually, when plants and animals die, the carbon contained in them is stored in the soil as those organisms decompose (measured in C/hr). Carbon stored in soils increases the soil quality by providing essential nutrients and helps mitigate greenhouse gas emissions, therefore increasing climate resilience. Certain soil types, such as Histosols, have a higher sequestration potential due to their high clay content. The maximum capacity of soil to store carbon is determined by its clay content, bulk density, and mineralogy. Climate and land management practices also influence how much carbon is actually stored in the soil. If the soil is disturbed, the stored carbon can be released back into the atmosphere. By promoting sustainable practices (such as maintaining ground cover), soil carbon sequestration can be maximized.

ADDITIONAL RESOURCES

- NRCs education materials (www.nrcs.usda.gov/wps/portal/nrcs/main/solls/edu/)
- SSSA resources (www.soils4teachers.org/esse/)

Learning Activities:

1. Examine the map, “Soils’ Role in Carbon Sequestration” and determine what the carbon sequestration potential of the soil is in your area. How does it compare to other areas? What trends do you see on the map?

2. Compare the green areas on the soil sequestration map to the soils map on the front of the poster. Do you see any trends? Analyze the information from the map, and compare it to other data sources (https://bit.ly/SCSequestration).

SOILS THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS (SDGs)

According to the NRCS, a healthy soil is one that has “the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.” Understanding how we can keep soils healthy is vital for sustainability. The SDGs that can be tied directly to the health and use of soils are outlined below along with related activities. The United Nations has more information to learn about all the SDGs (https://sdgs.un.org/goals).

SOILS AND THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS (SDGs)

- SDG 2: Zero hunger
- SDG 7: Affordable and clean energy
- SDG 8: Decent work and economic growth
- SDG 9: Industry, innovation, and infrastructure
- SDG 11: Sustainable cities and communities
- SDG 12: Responsible consumption and production

Learning Activities:

- When organic compounds in soil are decomposed, carbon dioxide is released to the environment. Watch soil respiration in action: https://bit.ly/SoilRespirationLab
- Soils are alive and support the growth of plants, animals, bacteria, and fungi. Go outside and see for yourself! Investigate life in soil: https://bit.ly/LifeInSoil

Credit: Pat Scullion/SSSA. Image Credits: Organisms, Climate, Relief: Morgue File. Parent, Time: Adobestock

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