

Phinizy Swamp Nature Park Teacher Field Trip Preparation Guide

Program: Phinizy Down Under

Objective: To introduce students to the basics of soil science by teaching them identification of soils by texture, classification of rocks, formation of soil, and permeability of different types of soils.

The following academic standards are covered on this field trip:

GPS6: CS1, CS2, CS3, CS4b, E5, M6P4, M6D1, M6M1, M6M2, M6P1, M6P5

GPS7: CS1, CS2, CS3, CS4b, L1, M7P4, M7D1, M7P1, M7P5

GPS8: CS1, CS2, CS3, CS4b, M7P1, M7P4, M7P5

S.C. Science Standards: 6-1.1, 1.3, 1.5; 7-1.1, 1.4, 1.7, 4.4;

8-1.2, 1.5, 1.6, 1.7

Vocabulary:

Clay: Mineral particles that are sticky when wet, and the individual parts can only be seen with an electron microscope.

Organic soils: Soils that contain partially decayed plant and/or animal material.

Mineral soils: Soils that contain different percentages of sand, silt, and clay, with little or no organics.

Compaction: When soil particles are forced closer together, decreasing pore space.

Erosion: The wearing away of the land surface (soil) by wind or water.

Extrusive: Describing igneous rocks that cool rapidly at the earth's surface, usually forming small crystals.

Hydric Soil: Soil showing the effects of the presence of water.

Igneous: Rocks formed by the cooling and hardening of magma or lava.

Intrusive: Describing igneous rocks that cool slowly below the earth's surface usually forming large crystals.

Lava: Melted rock on the earth's surface.

Magma: Melted rock below the earth's surface.

Metamorphic: Rocks changed by heat and pressure while under the earth's surface.

Mineral: Inorganic natural solid material.

Permeability: The rate that a liquid can flow through a substance.

Pore spaces: The size of spaces between soil particles (sand, silt, and clay).

Rock: Material that is the solid portion of the earth's crust containing one or more minerals.

Sand: Mineral particles that are coarse and gritty to touch and the individual parts may be seen with the naked eye.

Sedimentary: Rocks formed by weathering and erosion of pre-existing rock, with the particles becoming layered and turning solid through compaction.

Silt: Mineral particles that are smooth and slippery to the touch when wet, and these individual particles can only be seen with a microscope.

Soil: Small particles of rock that have been weathered, and/or partially decayed plant and animal material.

Soil Profile: A vertical section of soil that has been dug through horizontal layers, called horizons.

Soil Texture: The way a soil feels as a result of the percentage of clay, sand, and silt (three components of soil).

Water Table: The upper limit of water saturation in the ground

Weathering: The process of breaking down rocks and soils through contact with the atmosphere.

Wetland: An area characterized by water at or below the surface, low-oxygen soils, and special wetland plant species.

Teacher Background Information:

About Soil Texture

What exactly is soil texture?

- Soil texture is used by soil scientists to determine the percentage of silt, sand, and clay in mineral soils. This determines the type of soil. The texture of a soil is important in indicating the availability of moisture and nutrients for plant growth.
- By feeling damp soil between fingers or in the palm of a hand, trying to form a ball of damp soil about two inches in diameter, and trying to form a ribbon from that ball (squeezing the ball between thumb and forefinger), scientists can distinguish different soil types.
- A soil profile can be observed when digging vertically through the horizontal layers, or horizons, of the soil. A soil profile shows scientists the amount of weathering along the surface of the earth, and determines how the soil may be classified for plant growth.
- The three main horizons for most soils include the surface horizon at the top, the subsoil in the middle, and the substratum below. Some soils have an organic horizon at the surface, although this horizon may also be buried.

About Rock Classification and Soil Formation

How do we classify rocks and how is soil formed?

- Rocks are divided into one of three categories: igneous, metamorphic, or sedimentary. Igneous rocks form from heating and then cooling, coming from molten mixtures deep within the earth (magma or lava). Examples include granite, obsidian, and pumice. Metamorphic rocks are rocks already formed, but change through heat and pressure. Examples include quartz, marble, slate, and schist. Sedimentary rocks form from mud, sand, clay or other minerals that are carried and deposited by weathering, and then are compressed. Examples of sedimentary rocks include limestone, sandstone, shale, and conglomerates. Fossils are also found in sedimentary rocks.
- Sedimentary rocks may become igneous by heat and pressure with melting and re-crystallization, or may become metamorphic by heat and pressure without melting. Igneous rocks may become sedimentary by weathering and erosion, and metamorphic by heat and pressure without melting. Metamorphic rocks may become sedimentary by weathering and erosion, or igneous by heat and pressure with melting and then re-crystallization.
- Weathering, the breaking down of rock material exposed to the atmosphere, is the catalyst for soil formation. Mechanical weathering is when rocks are broken down into smaller particles physically. Freezing and thawing, burrowing animals, and plant roots

are examples of how mechanical weathering may happen. Chemical weathering not only breaks down rock to smaller particles, but alters the chemistry of the rock as well. Rain, oxygen, and acids from decomposition are examples of agents that promote chemical weathering.

- After weathering, the particles are moved through erosion. Examples of forces causing erosion include ocean tides, waves, wind, and gravity.

About Soil Permeability

What is soil porosity and how does it relate to soil permeability?

- Pore spaces are the open spaces between the particles of soil. Therefore, the amount of porosity, or number of pore spaces, of a soil indicates the volume of air or water it can hold. This has an impact on the types of plants that may grow in certain types of soil.
- Soil permeability refers to how quickly a liquid flows through a type of soil. Clays have the smallest pore size whereas sand has the largest pore size. Silt is in-between. This means that a soil with more sand has a higher soil permeability rate: the soil has a faster and greater water flow rate versus one with more silt. Due to such small pore sizes, a clay soil has zero permeability, so water remains standing on the surface above the clay as in many wetlands.

On Wetlands

What is a wetland?

A wetland is just that, wet land. A wetland is an area that has all three of the following characteristics:

- Low-oxygen (anaerobic), hydric (water-saturated) soil
- Special hydrophytic (water tolerant) plants that can survive in low-oxygen conditions
- A hydrologic regime where water is frequently at, just below, or just above the ground's surface, creating saturated conditions that lead to the development of hydric soils and the presence of hydrophytic plants (the level of water often fluctuates and is far from constant)

Where are wetlands located?

- All over the world and in every state in the U.S
- They can be freshwater or saltwater
- They can be along a body of water or independent from another water source
- They are often transitional areas located between dry land and deeper aquatic systems such as rivers and lakes
- They can be forested or not forested
- 5% of U.S. wetlands are coastal wetlands, while 95% are inland wetlands

What are some examples of wetlands?

- Marshes: dominated by herbaceous vegetation, with water levels from 3 feet to 6 inches or less. Includes salt marshes, fresh water marshes, and brackish marshes
- Swamps: dominated by woody trees or shrubs
- Wet meadows: a type of marsh dominated by grasses or sedges, with water levels at 6 inches or less
- Prairie Potholes: water-filled glacial depressions located primarily in the mid-west. An important site for waterfowl

- Bogs and Fens: wetlands with peat for soil due to low decomposition rates
- Vernal Pools: Temporary pockets of water that fill depressions in wooded areas, meadows, and river floodplains
- Carolina Bays: Unique wetlands found primarily in the coastal plain of North Carolina, South Carolina, and Georgia which are typically shallow, oval depressions

What wetlands exist at Phinizy Swamp Nature Park?

- Floodplain swamp (a swamp that exists near a stream or river)
- Constructed wetland marshes (human-made grassy wetlands)
- Oxbow Lakes and River Scars (remnants of where a river used to flow)

Why is it important to protect wetlands (values of wetlands)?

- They improve water quality by intercepting surface runoff and removing nutrients, waste and sediment from water
- They slow water down and prevent erosion
- They soak up floodwaters thus preventing downstream floods
- They provide areas of recreation and beauty
- They provide essential habitat for many diverse and often endangered species. Up to 45% of threatened or endangered species rely on wetlands for their survival
- They furnish natural products such as food, timber, fur to humans
- Some help to recharge groundwater supplies
- They provide areas for education and research
- Some wetlands support downstream aquatic systems
- The U.S. has lost over 50% of our wetlands to agricultural conversion, mining, and urban development

Suggested Activities for before or after the field trip:

*****Consider calling us for one of our loan boxes that matches with each field trip - they contain many fun activities for you and your students!*****