Dickson
Tennessee State Soil

Photo Soil Monolith: Chip Clark/Smithsonian Institution

Soil Science Society of America

Introduction

Many states have a designated state bird, flower, fish, tree, rock, etc. And, many states also have a state soil – one that has significance or is important to the state. The Dickson is the official state soil of Tennessee. Let's explore how the Dickson is important to Tennessee.

History

The Dickson series was established in 1923 in Dickson County, Tennessee, where it was first mapped in the Soil Survey of Dickson County, Tennessee (published 1926). At the time of the first soil survey about 50% of the acreage was being cultivated with the remaining acreage in forestland. Hugh Hammond Bennett collected samples of Dickson soils from both cultivated and forested settings and studied the moisture retention of the soils. Dickson was selected by the Tennessee NRCS Soil Survey Staff as the state soil due to its acreage and extent mapped within Tennessee.

What is Dickson Soil?

Every soil can be separated into three separate size fractions called *sand*, *silt*, and *clay*, which makes up the *soil texture*. They are present in all soils in different proportions and say a lot about the character of the soil. In a typical profile of Dickson, the topsoil is brown, friable (easily crumbles) silt loam. The subsoil is yellowish brown to pale brown, friable silt loam. Within the subsoil layer, at a depth ranging from 18 to 36 inches, is a compact and brittle layer called a *fragipan*. A fragipan is very dense and almost cement like. The fragipan restricts root growth and slows or stops water from moving through the soil profile. The fragipan is a very firm (does not crumble easily), yellowish brown silt loam or silty clay loam. Below the fragipan, to a depth of about 7 feet, is a layer of firm (does not crumble easily), red clay weathered from limestone (**Figure 1**).

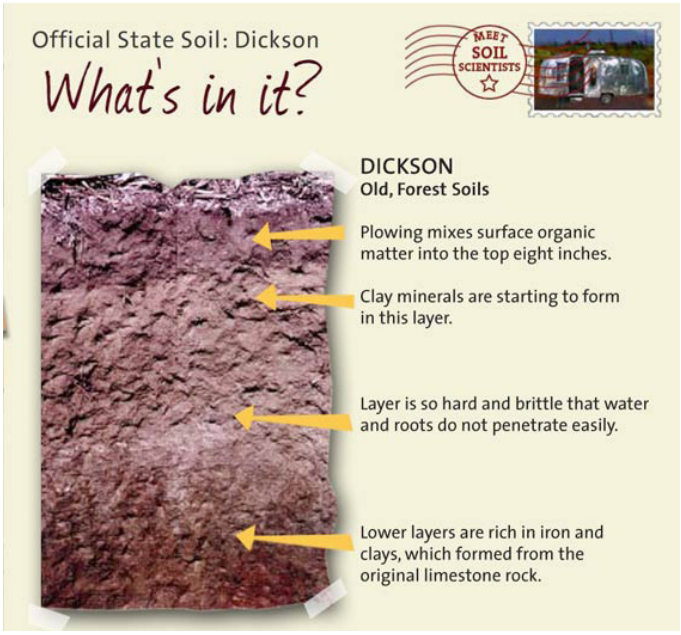

Fig. 1 Soil profile of a Dickson soil. Credit Smithsonian Institution's Forces of Change.

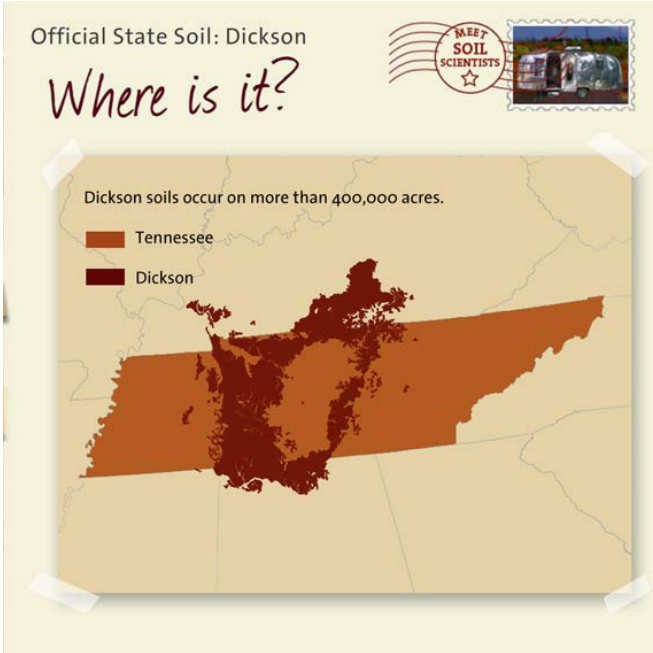

Fig. 2 Location of the Dickson soil in Tennessee. Credit: Smithsonian Institution's Forces of Change.

Fig. 3 Soybean row crops.

Where to dig Dickson

Yes, you can dig a soil. It is called a soil pit and it shows you the *soil profile*. The different horizontal layers of the soil are called *soil horizons*. This does not mean that other types of soil cannot be found there but that the Dickson soil is the most common. Dickson soil covers 400,000 in 31 counties of Tennessee, four counties in Alabama, and five counties in Kentucky (**Figure 2**). In all, there are a total of 442 named soils in Tennessee.

Importance

What makes the Dickson soil so important is its use and prevalence in the State. It is important in the production of small grains, soybeans, and tobacco as well as for pasture and hay.

In general, soils can be used for agriculture (growing foods, raising animals, stables); engineering (roads, buildings, tunnels); ecology (wildlife habitat, wetlands), recreation (ball fields, playground, camp areas) and more. Dickson soils occur on more than 400,000 acres. Corn and soybeans are the principal row crops (**Figure 3**) and most pastures support tall fescue and white clover. Some areas are in forest chiefly of oaks, yellow-poplar, hickories, gums, and maples.

When a soil cannot be used for one or more of the described functions, it is referred to as a limitation. Soil experts, called *Soil Scientists*, studied Dickson soil and identified that it has a *perched water table* limitation (**Figure 4**). This means that groundwater accumulates above the water table because it is trapped above a soil layer that is not permeable. The seasonally perched water table results in the soil being poorly suited to residential and commercial uses such as local roads, dwellings with basements, and septic tank absorption fields just to name a few. It is well suited for woodland, cropland, and pasture and hay.

Dickson Formation

Before there was soil there were rocks and in between, CLORPT. Without CLORPT, there will be no soil. So, what is CLORPT? It is the five major factors that are responsible for forming a soil like the Downer series. It stands for **Cl**imate, **O**rganisms, **R**elief, **P**arent material and **T**ime. CLORPT is responsible for the development of soil profiles and chemical properties that differentiate soils. So, the characteristics of Dickson (and all other soils) are determined by the influence of CLORPT. Weathering takes place when environmental processes such as rainfall, freezing and thawing act on rocks causing them to dissolve or fracture and break into pieces. CLORPT then acts on rock pieces, marine sediments and vegetative materials to form soils.

Climate – Temperature and precipitation influence the rate at which parent materials weather and dead plants and animals decompose. They affect the chemical, physical and biological relationships in the soil. The mean annual precipitation is about50 inches, and the mean annual air temperature is about 60 degrees F and the average annual precipitation is about 50 inches.

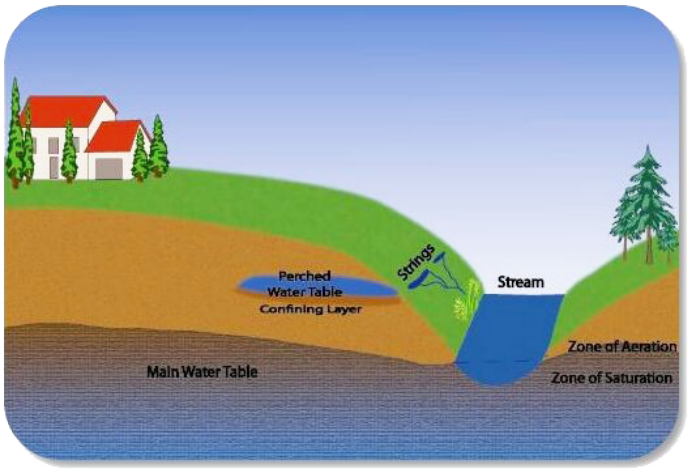

Fig. 4 Perched water table illustration. Source: Department of Water and Sanitation, Republic of South Africa. www.dwa.gov.za

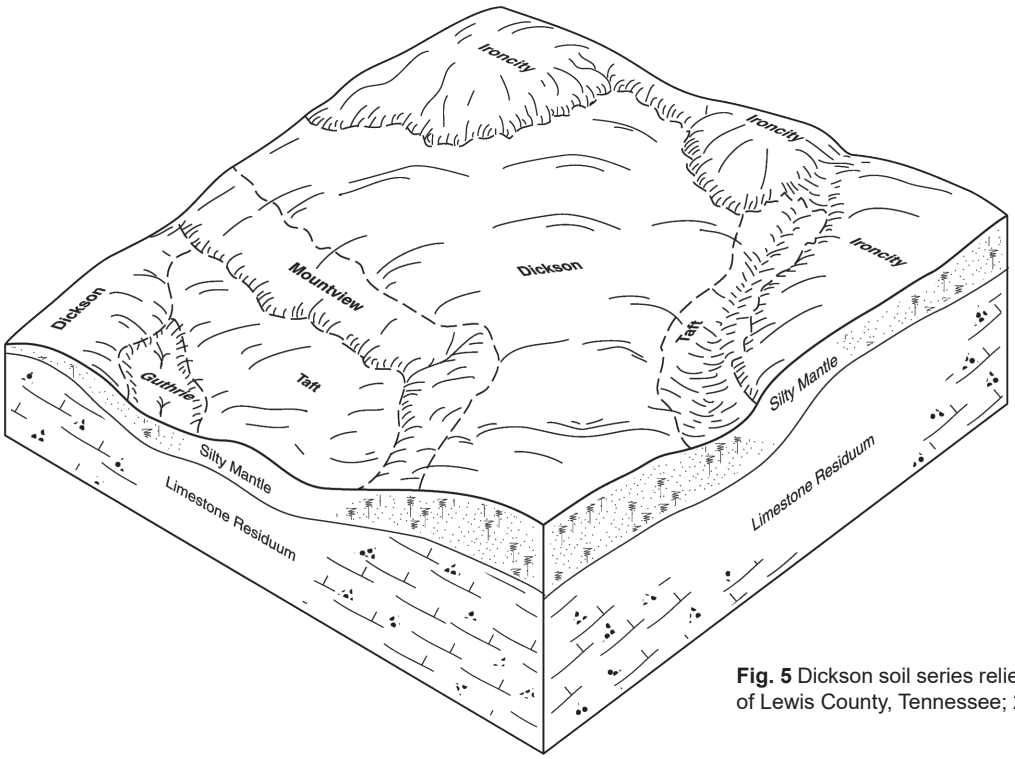

Fig. 5 Dickson soil series relief. Credit: Soil Survey of Lewis County, Tennessee; 2006

Organisms – This refers to plants and animal life. In the soil, plant roots spread, animals burrow in, and bacteria break down plant and animal tissue. These and other soil organisms speed up the breakdown of large soil particles into smaller ones. Plants and animals also influence the formation and differentiation of soil horizons. Plants determine the kinds and amounts of *organic matter* that are added to a soil under normal conditions. Animals breakdown complex compounds into small ones and in so doing add organic matter to soil. Insects, earthworm and small mammals contributed to the formation of this soil**.**

Relief – Landform position or relief describes the shape of the land (hills and valleys), and the direction it faces which makes a difference in how much sunlight the soil gets and how much water it keeps. Deeper soils form at the bottom of the hill rather than at the top because gravity and water move soil particles downhill. Dickson soils are on nearly level to undulating ridges on uplands. Slopes range from 0 to 12 percent, but are commonly less than 8 percent (**Figure 5**).

Parent material (C horizon) – Just like people inherit characteristics from their parents, every soil inherits some traits from the material from which it forms. Some parent materials are transported and deposited by glaciers, wind, water, or gravity. The Dickson series consists of very deep, moderately well drained soils that formed in a silty mantle 2 to 4 feet thick and in the underlying limestone residuum.) *Residuum* is often used to refer to the soil and subsoil that forms as the result of long weathering over carbonate rocks (limestone and dolomite) bedrock. It is defined primarily as "the unconsolidated weathered at least partly, mineral material that has accumulated as consolidated rocks disintegrated in place. It is a type of soil parent material which has formed in its place of origin (source: Wikipedia).

Time – All the factors act together over a very long period of time to produce soils. As a result, soils vary in age. The length of time that soil material has been exposed to the soil-forming processes makes older soils different from younger soils. Generally, older soils have better defined horizons than younger soils. Less time is needed for a soil profile to develop in a humid and warm area with dense vegetative cover than in a cold dry area with sparse plant cover. More time is required for the formation of a well-defined soil profile in soils with fine textured material than in soils with coarse-textured soil material.

Glossary

Clay: A soil particle that is less than 0.002 mm in diameter. Clay particles are so fine they have more surface area for reaction. They hold a lot of nutrients and water in the soil. A clay soil is a soil that has more than 40% clay, less than 45% sand and less than 40% silt.

Ecoregion: Represents areas with similar biotic and abiotic characteristics which determine the resource potential and likely responses to natural and man-made disturbances. Characteristics such as climate, topography, geology, soils, and natural vegetation define an ecoregion. They determine the type of land cover that can exist and influence the range of land use practices that are possible.

Fragipan: A natural subsurface horizon with very low organic matter, high bulk density and/or high mechanical strength relative to overlying and underlying horizons; has hard or very hard consistence (seemingly cemented) when dry, but showing a moderate to weak brittleness when moist.

Horizon: see Soil horizons

Organic matter: Material derived from the decay of plants and animals. Always contains compounds of carbon and hydrogen.

Perched water table: A perched water table is an accumulation of groundwater located above a water table in an unsaturated zone. The groundwater is usually trapped above a soil layer that is impermeable and forms a lens of saturated material in the unsaturated zone. Source: reference.com

Sand: A soil particle between 0.05 and 2.0 mm in diameter. Sand is also used to describe soil texture according to the soil textural triangle, for example, loamy sand.

Silt: A soil particle between 0.002 and 0.05 mm diameter. It is also used to describe a soil textural class.

Soil Horizon: A layer of soil with properties that differ from the layers above or below it.

Soil Profile: The sequence of natural layers, or horizons, in a soil. It extends from the surface downward to unconsolidated material. Most soils have three major horizons, called the surface horizon, the subsoil, and the substratum.

Soil Scientist: A soil scientist studies the upper few meters of the Earth's crust in terms of its physical and chemical properties; distribution, genesis and morphology; and biological components. A soil scientist needs a strong background in the physical and biological sciences and mathematics.

Soil Texture: The relative proportion of sand, slit, and clay particles that make up a soil. Sand particles are the largest and clay particles the smallest. Learn more about soil texture at www.soils4teachers.org/physical-properties

Additional Resources

Soil! Get the Inside Scoop. David Lindbo and others. Soil Science Society of America, Madison, WI.

Know Soil, Know Life. David L. Lindbo, Deb A. Kozlowski, and Clay Robinson, editors. Soil Science Society of America, Madison, WI.

Web Resources

Soils for Teachers—www.soils4teachers.org

Soils for Kids—http://www.soils4kids.org/

Have Questions? Ask a Soil Scientist—https://www.soils.org/ask

Soil Science Society of America—https://www.soils.org/

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