Natchez
Mississippi State Soil

Soil Science Society of America

Introduction

Mississippi has many state symbols such as birds, trees, flower, etc.. Similarly, the Natchez is the official state soil of Mississippi. A state soil is a soil that has significance or is important to the state. Let's find out how important the Natchez is to Mississippi!

History

In 1998, the Professional Soil Classifiers of Mississippi selected Natchez silt loam to represent the various soil resources of the State. On March13, 2003, Mississippi lawmakers designated the Natchez Silt Loam as the official state soil. This is a rich soil that is present along the bluffs of the Mississippi River Valley Silty Uplands, adjacent to the Mississippi River *Alluvial* flood plain. Natchez, which means "in the middle," is named after an Indian chief.

What is Natchez Soil?

The Natchez silt loam (**Figure 1**) consists of deep, well drained soils formed in thick deposits of *loess* that is rich in weatherable minerals. The *topsoil* has dark grayish brown color but the *subsoil* is brown, yellowish brown and dark yellowish brown down to a depth of 91cm (36 in.). The soils are strongly acid to neutral in pH in the upper part but have neutral to slightly alkaline pH in the lower parts. Natchez is an upland soil that occurs on strongly sloping to very steep hillsides. These hilly landscape are found in the highly dissected bluff hills that border the *alluvial plains* of the Mississippi River and its tributaries.

Fig. 1: Natchez soil profile. Credit: USDA-NRCS

Every soil can be separated into three separate size fractions called sand, silt, and clay, which make up the *soil texture*. They are present in all soils in different proportions and say a lot about the character of the soil. The Natchez is formed in thick *loess* accumulations that are high in silt and low in sand. The soil feels silty to touch, is moderately *permeable* to water, and runoff is very rapid. *Soil texture* in the *topsoil* and the *subsoil* is *silt* or *silt loam* but may have small shell fragments in the lower *horizons*.

Photo Soil Monolith: Chip Clark/Smithsonian Institution

Fig 2. (Above) Natchez soil series can be found from the north to south of the state covering about 19 counties. Credit: Smithsonian Institution.

Fig. 3. (Above left) Forest landscape setting of Natchez silt loam in a steep wooded area of the Mississippi silty uplands. (Photo by Karl Simon, Resource Soil Scientist.)

Where to dig the Natchez

When a soil pit is dug, it shows the *soil profile* which is a collection of horizontal layers of soil called *soil horizons*. They have different characteristics and properties for describing and identifying a soil. Natchez covers 171,559 acres (423,922 hectares) of land in 19 counties of Mississippi (**Figure 2**). Of the approximately 380 established soil series in the state, the Natchez can be found on the steep slopes of silty uplands which extend the length of the State at elevations above the Southern Mississippi River *Alluvial* valley. They occur on slopes ranging from 12 to 60 percent.

Importance

What makes the Natchez soil so important is its natural fertility and prevalence in the State. Despite its ruggedness, it is one of the most productive soils in the State. It has moderate natural fertility and desirable *tilth* but because it occurs on steep slopes that limit its use for cropping but made it suitable for woodlands. The undisturbed soil supports a picturesque sight of forested landscape where the bluffs tower 46 to 76 meters (150 to 250 feet) above the Delta.

Uses

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. The most common use of the Natchez is for woodlands due to fact that the soil series occur on steep slopes. However, a small amount where the slopes are less is cleared for row crops (cotton, corn and soybeans) and pasture for animal production are practiced (**Figure 3**). In the forested areas, the principal species are mixed hardwoods and loblolly pine.

Fig. 4. Natchez soil is part of the Sunken Trace, located near Port Gibson, MS. Credit: US Park Service

Limitations

When a soil cannot be used for one or more of the described functions, it is referred to as a limitation. *Soil Scientists* and natural resources conservation scientists studied the Natchez and concluded that because of the steepness and elevation of these soils, the uses are limited. They erode rapidly if they are not protected, that is why the soil has to be under permanent cover to conserve the soil and reduce soil erosion. Where they are cultivated, deep gullies and landslides are problems (**Figure 4**).

Management

Where the Natchez is cleared for row crops, the soil is very productive but good management must be practiced. Exposed soil faces the potential for erosion which removes the fertile and productive portion of the soil, and exposes the land to further degradation. This soil has to be under permanent cover, as such any type of disturbance or tillage cultivation activities are not recommended.

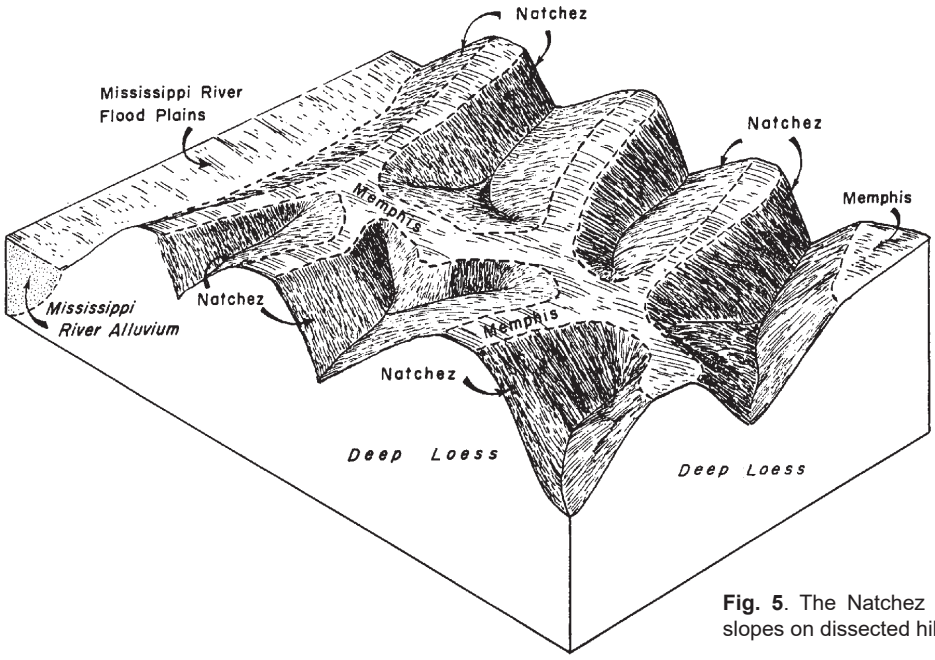

Fig. 5. The Natchez is an upland soil occurring on steep slopes on dissected hills. Image Credit: USDA-NRCS.

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 Natchez 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 the Natchez (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. Natchez soil developed under humid warm conditions where summer is hot and winter is mild. The mean annual temperature is approximately 63 °F although summer temperature can exceed 100 °F and average annual precipitation is about 132 cm (52 inches). The warm moist conditions favor the rapid chemical reactions and influence the kinds of plant and animal life.

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 kind and amount 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. The warm humid climate under which the Natchez developed promotes rapid biological activity. Natchez soil developed under hardwood forests and as leaves, twigs, roots and other plant material decompose, they improve the natural fertility of the soil. However, the rapid biological activity and the forest cover (compared to grass cover) do not allow accumulation of vast amounts of organic matter in the Natchez soil series. In the hilly parts where Natchez soil was developed, aerobic microorganisms help to decompose organic matter from leaves and plant tissue into other chemical compounds such as organic acids. Also present in this soil are small animals like springtails, millipedes, sowbugs, mites, nematodes, and plant organisms such as algae, fungi and actinomycetes.

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. The Natchez soil developed on steep slopes ranging from 12 to 60 per cent (Figure 5). On the hilly slopes where the Natchez developed, water infiltration is slow and the amount of water that percolates through the soil is small, however the Natchez is well drained due to its location on the landscape. Steep slopes have soils that are less well developed than soils on gentle slopes.

Parent material (C horizon) – Just like people inherit characteristics from their parents, every soil inherits some traits from the material from which it develops. Parent materials are transported and deposited by glaciers, wind, water, or gravity. During the Pleistocene age (this is an era of geologic time that began about 2.6 million until about 11,700 years ago), wind-blown silty material called loess was deposited in the area and from which the Natchez soil was formed. The windblown silty material was deposited on marine deposits. The deepest loess is in the more rugged area paralleling the bluffs along the Mississippi Alluvial Plain.

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.

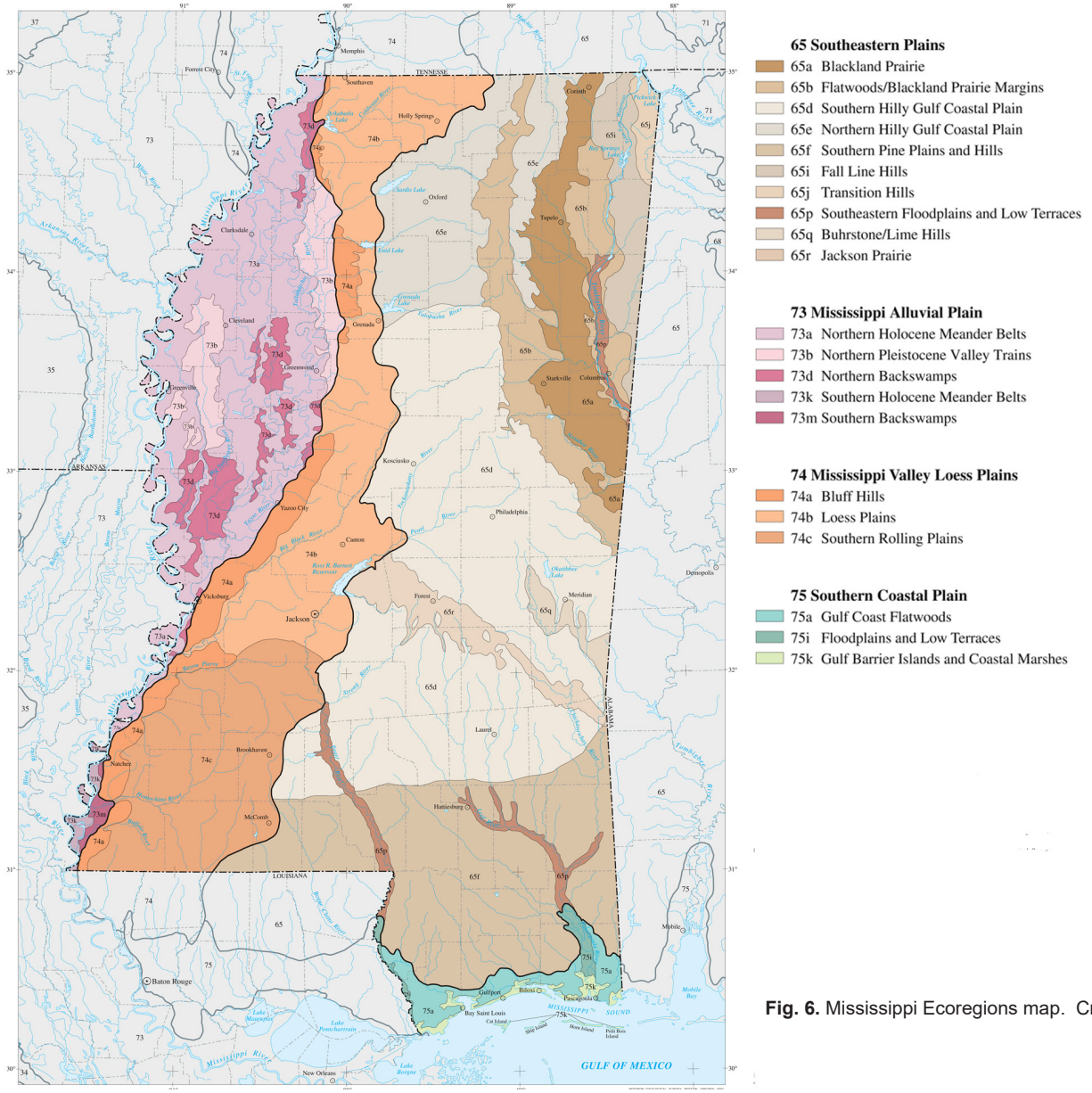

Fig. 6. Mississippi Ecoregions map. Credit: US-EPA

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. Soils at the bottom of the slopes are the youngest and soils in the uplands are oldest and have developed well-defined characteristics or horizons. Natchez soil being on the slopes is in-between. The Natchez soils are classified as Inceptisols, meaning that they are young soils or have developed in young material.

Ecoregions, Soils and Land Use in Mississippi

Mississippi is divided into 4 broad (Level III) and 21 more detailed (Level IV) ecoregions (Figure 7). Ecoregions indicate areas of general similarity in ecosystem and in the type, quality and quantity of environmental resources. The Natchez soil is distributed in the Mississippi Valley Loess Plains ecoregion. Apart from the ecoregions, the State can also be described on the basis of its physical geography **(Figure 6)**. The Mississippi Valley Loess Plains ecoregion corresponds, in part, to the Loess Hills (Bluff Hills) physiographic region of the State where the bluffs tower 46 to 76 meters (150 to 250 feet) above the Delta. It is said that the hill slopes are so steep to be cultivated and the valleys are too narrow and inaccessible to encourage very extensive farming operation. The region contains very deep, steep, silty and erosive soils and tends to be more dissected, steeper and more forested than the neighboring regions. In spite of its rough topography, it is one of the most productive in the State. The vegetation is typically made up of hard deciduous species such as oak, hickory, and evergreens like loblolly pines. Other common forest species include sweetgum, basswood, eastern hophornbeam and tulip poplar. Undisturbed bluff vegetation includes mesophytes such as beech and maples. Severe erosion is common in this region especially when the soils do not have adequate ground cover. Ecological and biological diversity in the State includes barrier islands, coastal lowlands, large river floodplain forests, rolling and hilly coastal plains with deciduous and evergreen forests, and aquatic habitats.

Glossary

Alluvial plain: Relatively open land area that serves to receive soil material like sand, silt and clay that have been deposited by stream or running water.

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.

Fertility: The relative ability of a soil to supply the nutrients essential to plant growth.

Geologic: relating to Geology

Geology: The study of the physical earth, its composition (materials), history and processes (physical and chemical) that act on it.

Horizon: see Soil horizons.

Infiltration: The process by which water on the ground surface enters the soil

Inceptisols: One of 12 soil orders of the U.S. system of soil taxonomy. They are young soils that are going through development of diagnostic profile features and are still changing. They are not yet like mature soils.

Loess: Parent material transported to and deposited in current location by wind.

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

Permeable: see permeability

Permeability: The ease or quality of a soil horizon that enables air, water and plant roots to pass through it.

Percolation: The downward movement of water through the soil.

Physiographic province: Are broad-scale geographic subdivisions based on similar terrain texture, rock type, and geologic structure, history and whose pattern of relief features differs significantly from that of adjacent regions.

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.

Silt Loam: a classification for soil material that contains 12-27% clay, 50% or more silt, or 50-80% silt and less than 12% clay.

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.

Tilth: The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and its impedance to seedling emergence and root penetration.

Topsoil: (A horizon or Surface horizon). The horizon that formed at the land surface. Mostly weathered minerals from parent material

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/

NACD www.nacdnet.org/education

Natural Resources Conservation Service, Mississippi Homepage -- http://www.nrcs.usda.gov/wps/portal/nrcs/site/ms/home/

Professional Soil Classifiers Association of Mississippi: http://pscam.org/links.htm

Mississippi Association of Conservation Districts (Envirothon & other programs) http://www.mississippilandcan.org/local-resources/Mississippi-Association-of-Conservation-Districts-Inc/4791

Smithsonian Institution http://forces.si.edu/soils/index.html

References

Lowe, E.N. 1919. Mississippi: Its Geology, Geography, Soil and Mineral Resources. Mississippi State Geological Survey. Bulletin No. 14.

Natural Resources Conservation Service, USDA. *Natchez – Mississippi State Soil*. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ms/soils/?cid=nrcs142p2_017216

Mississippi State University Extension: http://extension.msstate.edu/agriculture/crops/soils

Ecoregions of Mississippi. U.S. EPA Office of Research and Development (ORD) - National Health and Environmental Effects Research Laboratory (NHEERL), Corvallis, OR. https://www.epa.gov/eco-research/ecoregion-download-files-state-region-4#pane-22

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with Mississippi Agricultural Experiment Station. 1967. Soil Survey of Tate County, Mississippi.

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with Mississippi Agricultural Experiment Station. 1975. Soil Survey of Yazoo County, Mississippi

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with Mississippi Agricultural Experiment Station. 1959. Soil Survey of De Soto County, Mississippi

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This state soil booklet was developed under the auspices of the Soil Science Society of America's K-12 Committee—their dedication to developing outreach materials for the K-12 audience makes this material possible.