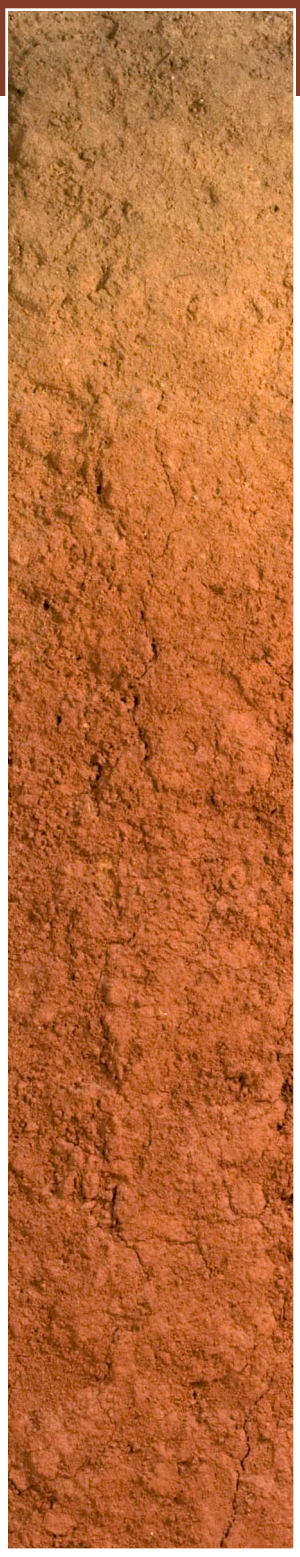
Bama
Alabama State Soil



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 **Bama Soil** is the official state soil of **Alabama**. Let's explore how the **Bama Soil** is important to **Alabama**.

History

The Bama Soil Series was specified as the state soil of Alabama by a resolution of the Alabama Legislature in April 1997. Its selection was made by members of the Professional Soil Classifiers Association of Alabama (PSCAA). They evaluated all the soils in Alabama for their location, acreage, soil productivity distinctive appearance, name recognition, and suitability for multiple uses. The Bama series was carefully selected among all the soils in Alabama to represent the state. Unfortunately, there is no soil series that is found in all 67 Alabama counties, because Alabama has so many different geographical regions.

What is Bama Soil?

Bama soils are very deep, well drained, and moderately permeable soils. These soils form from ancient marine and river sediments found on high ***terraces*** and Coastal Plain uplands **(Figure 1)**. Formation occurs in climates where annual air temperature is around 62 to 68°F and the average precipitation is about 56 to 65 inches. The land where Bama soils form is relatively level to gently sloping. Similar to many soils in Alabama, the Bama soil is relatively highly developed and weathered and is considered to be relatively old. It has undergone many thousands of years of intense weathering in the relatively high rainfall and warm climate of the region.

The fine fraction (without gravel or stones) of soils 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 it says a lot about the character of the soil. The Bama soil has a dark brown *sandy loam* (<20% clay, 45-85% sand, and <50% silt) *texture* at the surface. Below the surface horizon, also called the topsoil, there is a horizon (subsurface horizon) that is lighter in color but similar in texture. At depths below about 12 inches, the clay content increases, and typically this soil has a *sandy clay loam texture* (20-35% clay, 45-80% sand, and <30% silt). This layer can extend to several feet deep.

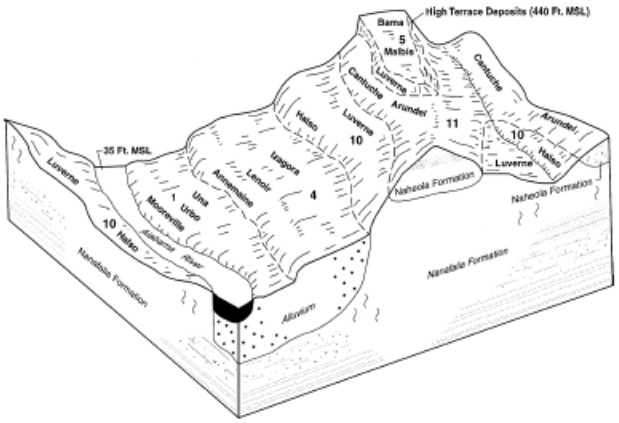


Fig. 1. Bama soil is found on high terraces on the landscape. USDA-NRCS, Soil Survey of Wilcox County, 1998.

Photo: Chip Clark/Smithsonian Institution

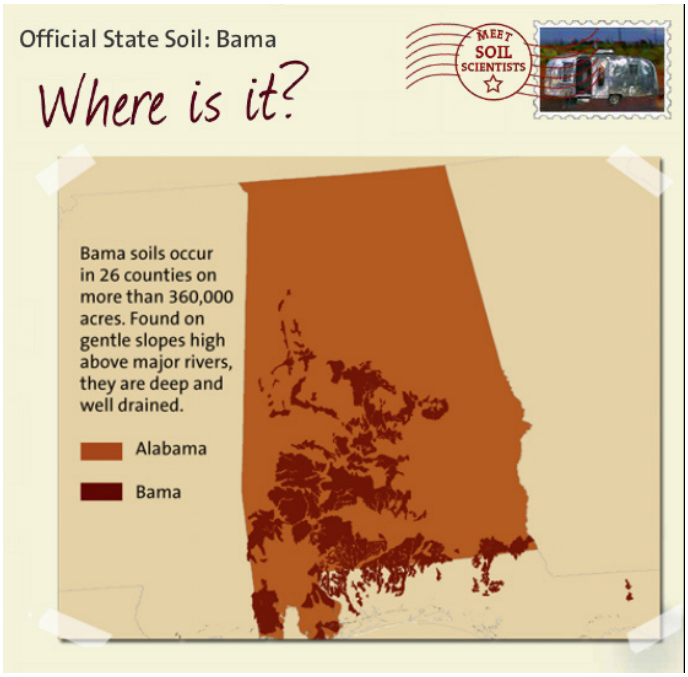


Fig. 2. Distribution of Bama soil in the state of Alabama. Credit: Smithsonian Institution's Forces of change. http://forces.si.edu/soils/interactive/statesoils/index.html

Perhaps one of the most distinguishing features of the Bama soil is its red subsoil. A reddish subsoil is a good indication of a well-drained soil. A good supply of oxygen in the subsoil keeps the iron in the soil oxidized resulting in a bright red color that is similar to rust. Good drainage is important for crop production and for many forest species such as pine trees.

Where to dig Bama Soil

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*. Bama soils are primarily found in the Coastal Plain of southern and western Alabama and extend into few other states such as Mississippi and Louisiana **(Figure 2)**. If you want to dig into the Bama soil, you are most likely to find it in the Western Coastal Plain of Alabama. For example, near Tuscaloosa, Alabama, there are almost 40,000 acres of Bama soil. Bama soil covers more than 360,000 acres of land in 26 counties of Alabama **(Figure 3)**. In all, there are a total of 460 named soils (series) in Alabama.

Importance

What makes the **Bama** soil so important is its use and prevalence in the State. The Bama soil is present in nearly 40% of Alabama counties and is well suited for many agricultural and urban land uses. It is considered prime farmland for the many acres of cotton, corn, soybean, peanuts, and pasture grown in the region. It is also highly suitable for roads and buildings, even those with basements and on-site waste disposal systems. Most of the Bama soils are classified in the class A hydrologic group because the sandy surfaces result in high infiltration rates and low potential for runoff. This is very important for water quality as it means that pollutants can be filtered out by the soil rather than running directly into nearby streams and rivers

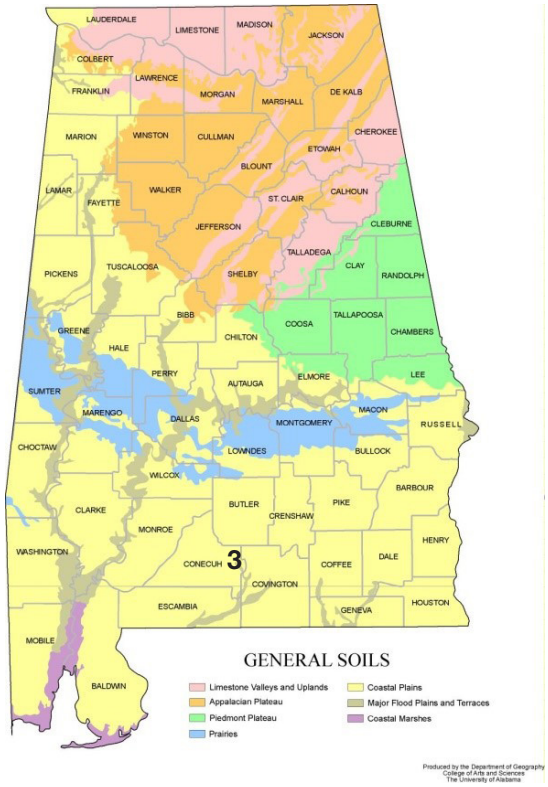


Fig. 3. Alabama soil areas. Credit: Department of Geography, University of Alabama. http://alabamamaps.ua.edu/contemporarymaps/alabama/physical/soils_map.jpg

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. Bama soils are well suited to many uses including crop production, pasture for hay or animal grazing, forest, and most urban uses. Cotton, corn, soybean, and peanuts are the main cultivated crops **(Figure 4)**. Forests are typically made up of longleaf and loblolly pines with some oak, hickory, dogwood, and sweetgum mixed within.

Fig.4. Cotton. Credit: USDA-NRCS

Fig. 5. Bama soil has a slight to moderate tendency to erode, especially when on a slope. Credit: USDA-NRCS.

Limitations

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*, have evaluated Bama soil and identified it as prime farmland with very few limitations for use. Bama soil has a slight to moderate tendency to erode, especially when on a slope **(Figure 5)**. This means that over time and especially if left bare, it can be blown or wasted away into nearby streams and rivers. This is especially a problem for roads and trails, which will not last long if the soil underneath disappears. It is also important to consider when producing crops as farmers should not over work the soil with plowing because it increases the potential for erosion.

Management

Bama soils are fairly acidic (typically around pH 5). Many cultivated crops will not grow at this pH, and lime is needed to increase the soil pH to a range more suitable for crops. In addition, the Bama soil does not have a huge ability to supply and hold nutrients. This means that frequent fertilizer additions are necessary on these soils, and these nutrients can easily be lost after a high rainfall event. The Bama soil does not have a high water holding capacity, so farmers and homeowners need to be aware that even short-term droughts can cause plants (e.g., crops and lawns) to require additional irrigation for survival.

Bama 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 **Bama** 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 **Bama soil** (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 Bama soil developed in a humid subtropical climate with fairly mild winters, warm and humid summers, and abundant rainfall.

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. The Bama soil developed under a mixed forest ecosystem; however, the warm and humid climate has caused most of the *organic matter* from these trees to degrade to levels typically less than 1% in the surface soil **(Figure 6)**.

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 Bama soil is relatively deep because it formed on relatively flat, highly weathered landscapes. Along with its sandy textures, this is a reason the Bama soil has such excellent drainage properties.

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 parent material of the Bama soil are ocean and

Fig. 6. Young Alabama pine forest. Credit: USDA-NRCS.

river (termed *fluviomarine*) sediments. They were deposited many years ago on high terraces and uplands and over time, the Bama soil has developed**.**

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. The Bama soil developed in a humid and warm climate with fairly dense vegetation over a relatively long time, so they are considered to be highly developed and very old. This weathering causes the minerals in the soil to be less reactive, which is one of the reasons they do not hold nutrients very well.

Ecoregions, Soils and Land Use in Alabama

Soils are dynamic natural bodies having properties dervied from the combined effects of climate and living organisms, as modified by the topography, acting on parent materials of soils, such as rocks, over time (Brady and Weil, 2007). Thus, climate, living organisms, topography, parent materials, and time are the five major soil forming factors. However, there are many different ways to describe an environment. The USEPA has classified ecoregions that incorporates geology, climate, soils, land use, wildlife, and hydrology to reflect different environments.

In Alabama, there are six major ecoregions: Southern Coastal Plain, Southeasterns Plains, Piedmont, Ridge and Valley, Southwestern Appalachians, and Interior Plateau **(Figure 7).** The Southern Coastal Plain (ecoregion 75), in which Bama soils is found, extends only around Mobile Bay and the Gulf of Mexico. This ecoregion receives considerable rainfall from the Gulf and its soils are relatively sandy. The Southeastern Plains (ecoregion 65) represent the largest ecoregion in the state. They surround the Southern Coastal Plain and most of the southern half of Alabama, as well as most of the area around the state's western border. This region represents an area that once was the shore of the Atlantic Ocean during the Mesozoic era. The region's warm and rainy climate, and past geologic history have caused the soils in this region to be relatively old and sandy. The Piedmont (ecoregion 45) actually starts in Alabama, but extends north to Virginia. Usually you can see a big difference in soil from the Southeastern Plains to the Piedmont as the Piedmont typically has more clay and tend to be redder than their southern neighboring soils. The Ridge and Valley (ecoregion 67) extends from Alabama all the way to New York parrallel the Appalacian mountians. As the name implies, the region is dominated by ridges and valleys ranging from 500 to 4,300 feet in elevation. Most of the area is forested. The Southwestern Appalacians (ecoregion 68) stretches north to Kentucky. This is the southern part of the Appalachian mountain range. It is mostly forested, and there is considerable mining in the area. The Interior Plateau (ecoregion 71) can be found in the northernmost part of Alabama. Unlike most of the other regions of Alabama, this region is mixed grassland and forest. The lands are relatively flat and suited for agriculture.

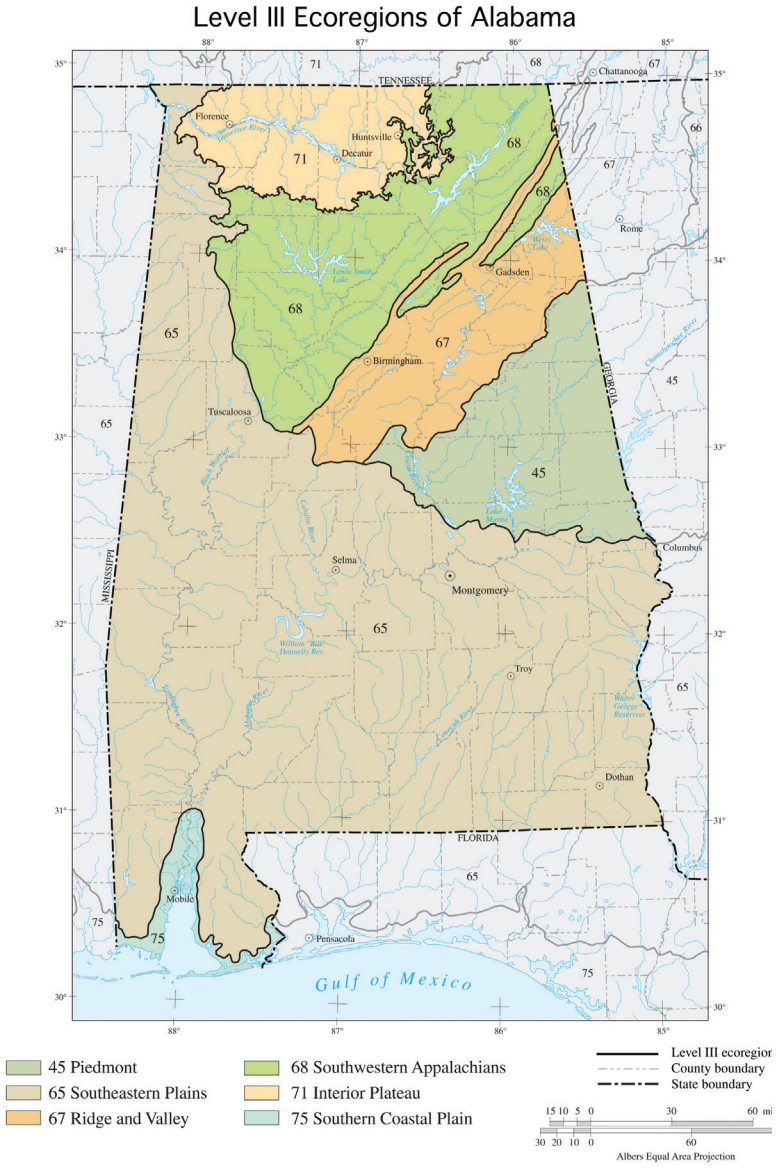


Fig. 7. The ecoregions of Alabama. Credit: USEPA-WED, ftp://ftp.epa.gov/wed/ecoregions/al/al_eco_l3_pg.pdf

Soil Areas in Alabama

The major soil areas in Alabama are Limestone Valleys and Uplands, Appalacian Plateau, Piedmont Plateau, Blackland Prairies, Coastal Plains, and Coastal Marshes. They are different but overlap with the ecoregion above.

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.

Horizon: see Soil horizons

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

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 Series: The name given to a group of soils with similar properties, such as soil origin, percentage sand, silt, and clay, and changes in properties with depth (i.e., soil name).

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**s** up a soil. Sand particles are the largest and clay particles the smallest. Learn more about soil texture at www.soils4teachers.org/physical-properties

Terrace: a nearly level step-like landform that borders a shoreline or river floodplain.

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

SOIL SCIENCE LINKS:

Soils for Teachers—www.soils4teachers.org

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

Have Questions? Ask a Soil Scientist—https://www.soils4teachers.org/ask

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

Discovering Alabama Teacher's Guide: Alabama Soils -- http://discoveringalabama.org/wp-content/uploads/2010/05/alabama_soils.pdf

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NRCS. Bama – Alabama State Soil. USDA-NRCS http://extension.illinois.edu/soil/st_soils/al_soil.htm

NRCS. Web Soil Survey http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

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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.