



# The Importance of Soil Types in Forage Production

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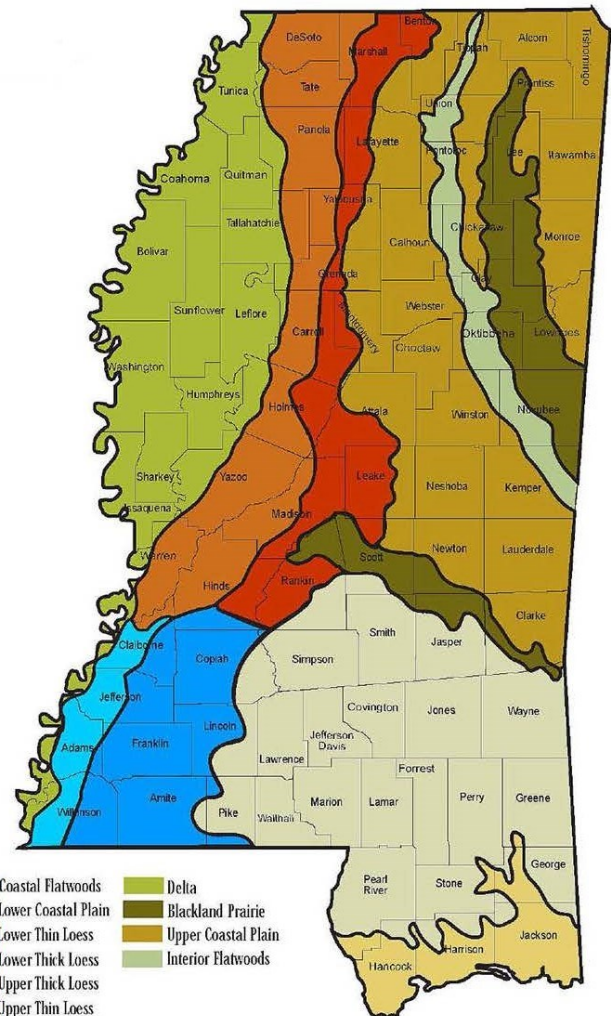
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Temperature, rainfall and soil types determine where forages can be grown. Mississippi is a geologically diverse state with different soil weather patterns and topographic regions that allow for the distribution of different soil classifications and soil types where forages can be adapted (Fig. 1). Soils range from shallow claypan to deep silt loam soils. These soils vary in many chemical and physical properties including water holding capacity, acidity, depth, and nutrient status. These properties can influence the suitability of a given soil's potential of forage production from the establishment, persistence to expected yields. To address this issue, forage producers should determine the soil type and forage suitability before deciding on what forage species to plant.

Sometimes we think that soil fertility and pasture productivity are related to just soil type, but it is more complex. Nutrient availability for forages is governed by soil type, water availability, soil temperature, soil organic matter content, soil microbial community structure and biomass, nutrient cycling, and the type of forage species in the pasture. For healthy and productive soils, the quantity and quality of organic matter available are important to maintain soil organisms that can recycle nutrients and break soil structure that can increase water infiltration. Deep, heavy clay soils can absorb a lot of water, allowing forage crops to have access to water under stress periods than sandy soil. Lighter, sandy soils also have very high infiltration rates, resulting in little or no run-off but limited water available to forage causing plants dying off more quickly under drought conditions.

Soil management is an important part of grazing and hay production practices. Producers need to understand that soil within their forage production system and implement management practice to improve soil health and sustainability. Soil management should be focused on two main properties: soil texture and soil structure. Soil structure refers to the size of particles that make a specific soil type [sand (large particles and clay (small particles))]. The management and properties of soil depend mainly on soil structure. Soil structure can impact nutrient and water holding capacity. Clay and clay loam soils will have a greater propensity to hold water and nutrients than sandy loams and sand. This means that the strategic application of fertilizers (especially nitrogen and potassium) may be more critical in sandy soils where nutrients can be transported to areas outside the root system area. Soil structure can be affected by management such as haying and grazing practices where compaction causes a reduction in air movement, water infiltration, and plant root development. On the other hand, soil texture refers



**Figure 1.** Major soil regions of Mississippi. Source: Oldham, 2012. MSU Ext. Pub. 2647.

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to the way particles aggregate and interact (sand, silt, and clay). Maintaining a healthy pasture can increase organic matter which aids in improving soil structure and nutrient retention (Table 1).

**Table 1.** Relationship between soil texture and plant growth based on soil bulk density.

	Soil Texture		
	Clayey	Sandy	Silty
	----- Bulk Density (g/cm <sup>3</sup> ) -----		
Ideal for plant grow	< 1.10	< 1.60	< 1.40
Restricts root growth	> 1.47	> 1.80	> 1.65

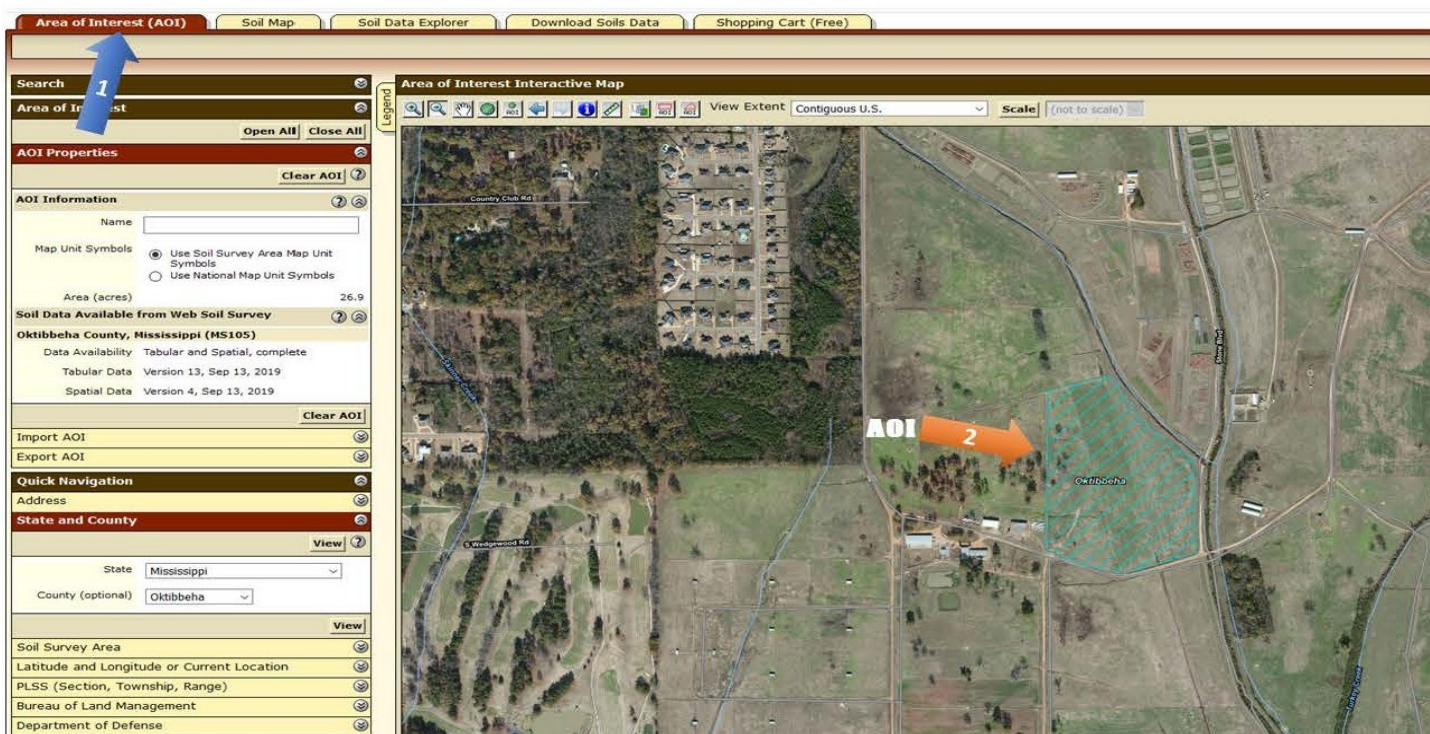
Source: USDA-NRCS. 2008. Soil quality indicators.

Cattle management can exert both beneficial and detrimental impacts on soil properties and nutrient cycling. The negative impact is the physical effects of treading. Treading can be caused by different factors such as soil moisture, soil physical properties, forage species, stocking rates, and time of grazing a paddock or pasture. Under wet conditions, the weight of the cattle and the hoof effect can compact the soil into small volumes and therefore increasing bulk density (soil weight per unit volume). Soil compaction can reduce soil volume in the rooting zone that can impact pore space (water and oxygen). Lower water infiltration rates can increase water runoff and soil erosion. The effect of treading can also be affected by the type of forage species present (perennial vs. annual). Well-established perennial grasses with a prolific root system in the top 8 inches of the soil can resist more treading. Plants with a rhizomatous or stoloniferous root system such as bahiagrass or bermudagrass can reduce treading.

A good quality soil also depends on nutrient availability. A positive aspect of cattle management and soil impact is that livestock can produce large quantities of dung and urine that can be deposited more uniformly in the pasture with a well-planned rotational grazing system. Approximately 75, 80 and 85% of the nitrogen, phosphorus, and potassium in forages consumed by cattle pass through the digestive system of the animal and they are excreted in urine (urea) and feces. The organic matter in the dung can also help to build soil organic matter and improve soil physical properties. Under microbial activity, these recycled nutrients can become plant nutrients. Keep in mind that grazing practices affect the distribution of recycled nutrients.

Producers can also use soil type information to determine forage productivity potential. They can access such information from the NRCS Web Soil Survey Website (<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>). There are four basic steps to obtain forage information needed:

1. Click on the **AREA OF INTEREST (AOI)** tab and then the field in your farm by entering an address or the coordinates (latitude and longitude) of the area of interest. Once you have found the area, use the AOI Polygon tool to define the boundaries of your field. Once you have completed the polygon, a new map with the area you defined will appear (Fig. 2).



**Figure 2.** Selecting the area of interest in Web Soil Survey.

- Click in the **SOIL MAP** tab and it will provide information on the soil map unit names, soil names, acreages, and percentages of each soil type are represented in the AOI selected (Fig. 3).

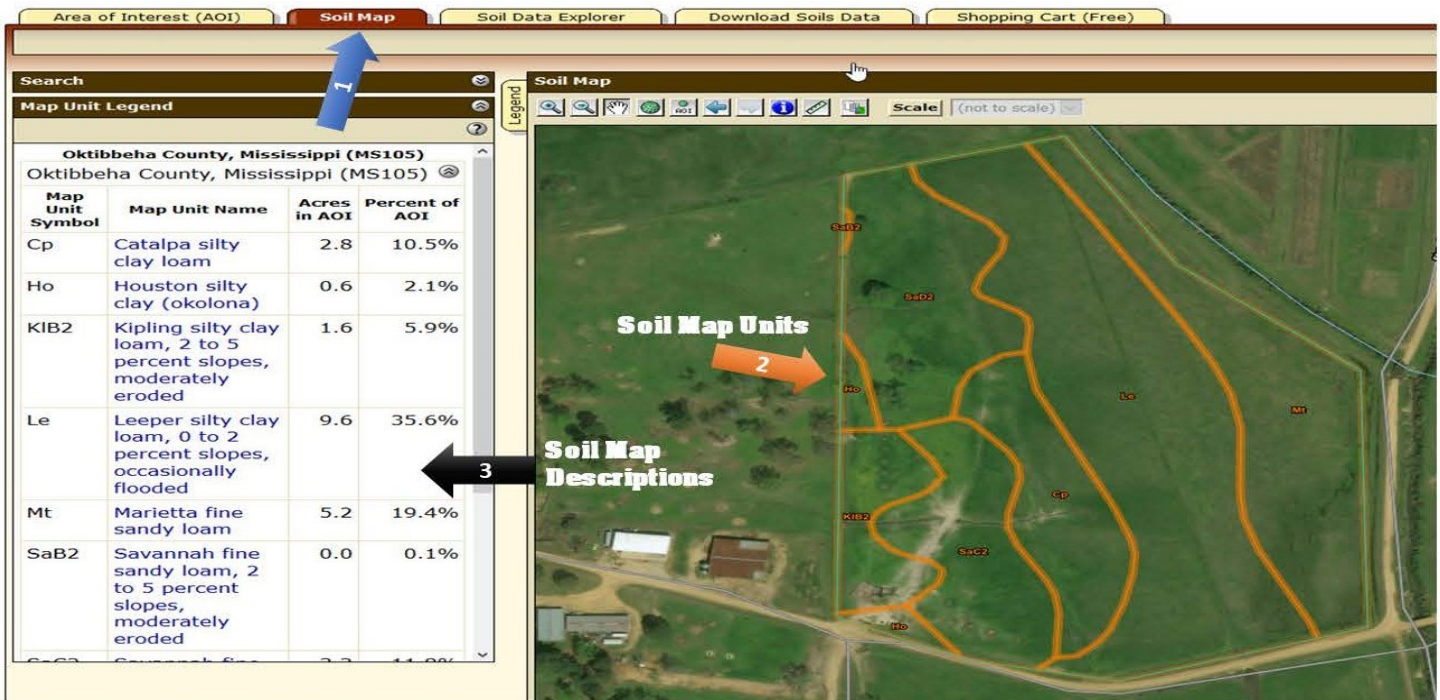


Figure 3. Determining the soil types in the selected area of interest.

- The **SOIL DATA EXPLORER** tab will allow different soil characteristics for the AOI that was selected. Select the subtab "**Suitabilities and Limitations for Use**" and then from the list of options select "**Vegetative Productivity**." When selecting this option, another drop-down menu will appear. Since no forage crops are irrigated in the southern USA, choose "**Yields of Non-irrigated Crops (component)**." After this selection, another menu drops down and you can choose pasture or hay. After selecting the pasture or hay, select "**View Description**" and read the description. Then select "**View Rating**" and a new map and table will appear with the ratings for pasture in animal unit month (AUM) or hay ratings in tons/acre if applicable (Fig. 4).

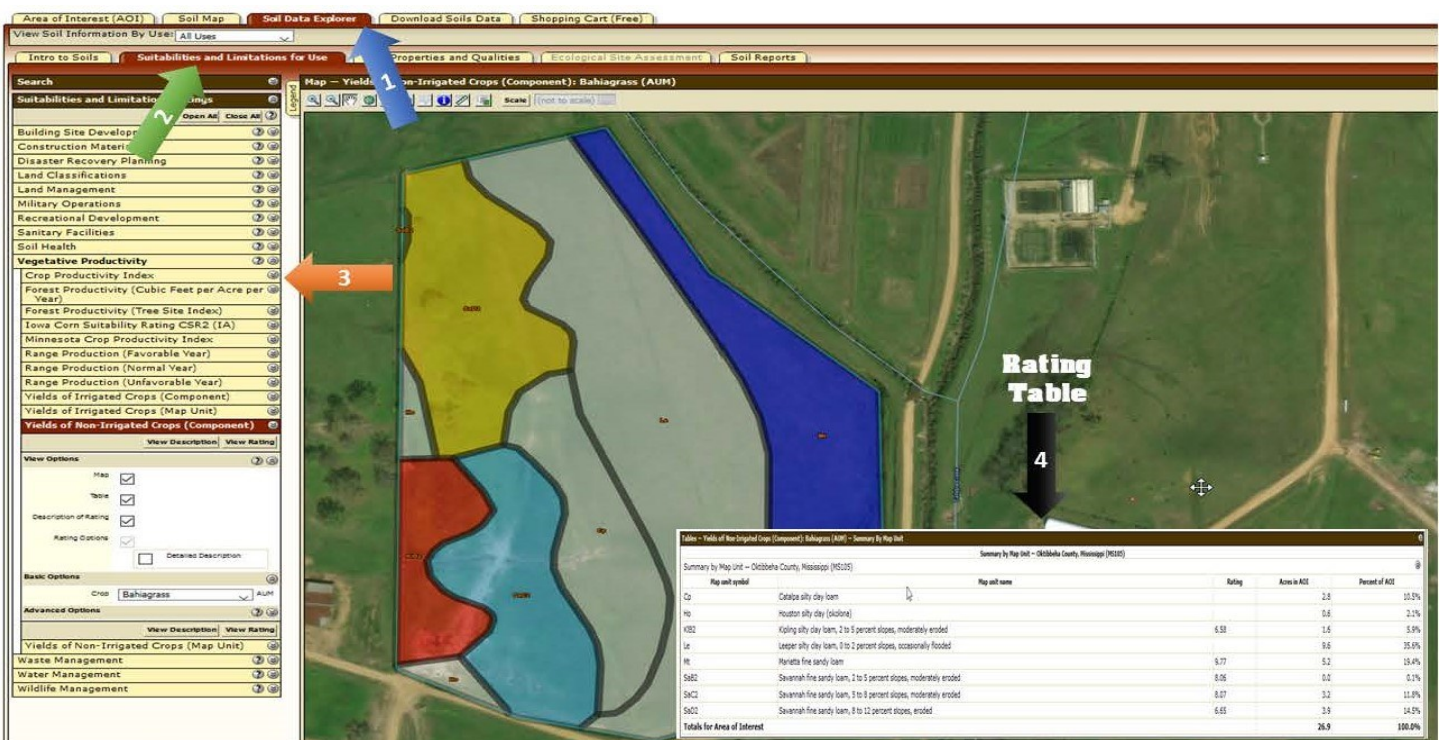
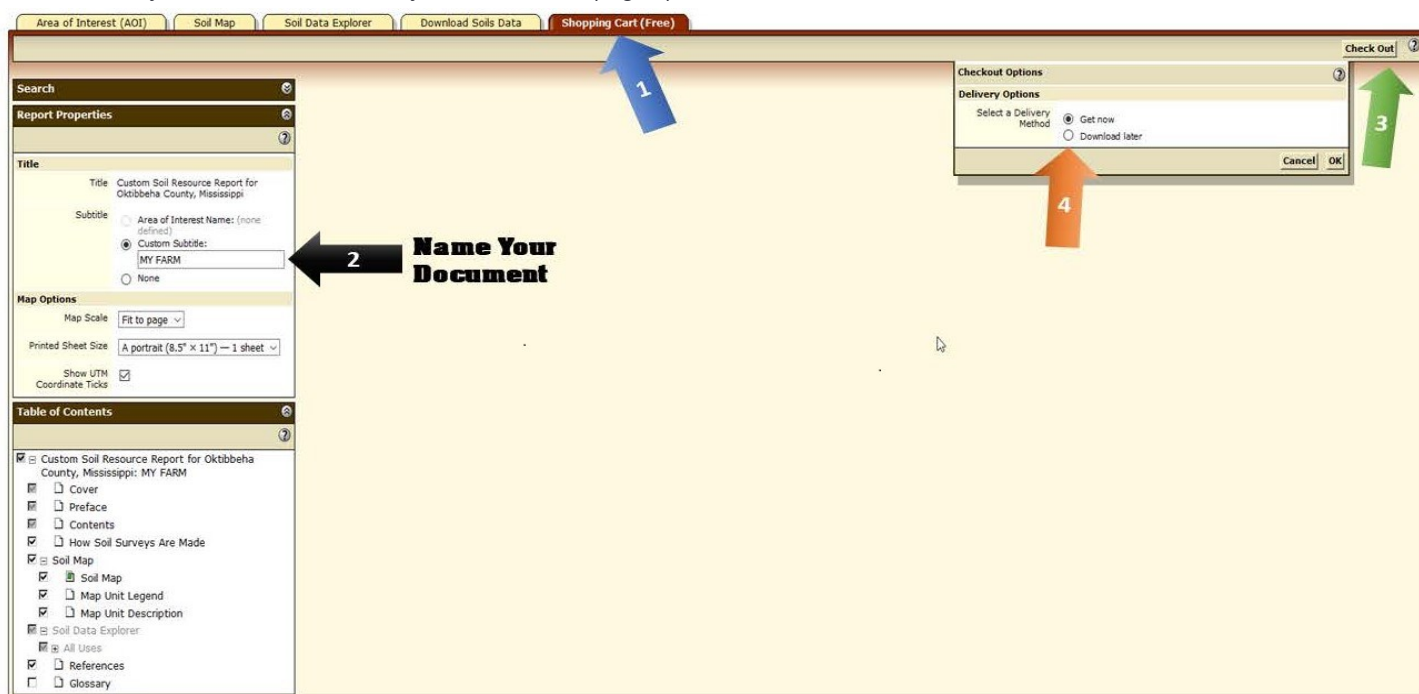


Figure 4. Determining the productivity rating for soils in the selected area of interest.

- Finally, select the **ADD TO SHOPPING CART** tab. This is a free shopping cart that allows placing your report created. Then, check “Check Out” to get a copy of your report and how you will like to have the report delivered (get now or deliver later). If the file created is too large, you will ask to provide an email to notify you when the file ready for download (Fig. 5).



**Figure 5.** Finalizing the soil report for the selected area in your farm.

Variability of soil characteristics and microclimate results in soil differences within pastures and may require different management than an adjacent field or the whole farm. This is very important when taking soil samples and defining a nutrient management plan. Using soils as a tool for forage management and adaptation of forage species allows producers to extend the grazing season and provide an added value for livestock sustainability. Always manage to maximize forage production relative to soil capabilities. This means establishing boundaries to reduce soil losses based on the potential productivity of the soils while maintaining soils in a sustainable productive state while measuring animal output such as pounds of beef or milk per acre.

### Upcoming Events

- February 19, 2020—Central Producer Advisory Meeting, Raymond, MS.
- February 20, 2020—North Mississippi Producer Advisory Meeting, Verona, MS.
- February 27, 2020—CREC Producer Advisory Meeting, Biloxi, MS.
- March 26, 2020—Coastal Plain Experiment Station Beef Cattle Field Day, Newton, MS.

For upcoming forage related events visit: <http://forages.pss.msstate.edu/events.html>

**COASTAL PLAIN  
BEEF CATTLE FIELD DAY**

COASTAL PLAIN BRANCH EXPERIMENT STATION  
51 COASTAL PLAIN ROAD, NEWTON, MS 39345

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**Thursday March 26, 2020**

MISSISSIPPI STATE  
UNIVERSITY  
COASTAL PLAIN BRANCH  
FORESTRY EXPERIMENT STATION

**Registration: 2:00**  
**Program: 2:30 – 6:00**

Catered Dinner Provided

MISSISSIPPI STATE  
UNIVERSITY  
EXTENSION

Herd Improvement

Grazing Cover Crops

Variety Selection

Drought Insurance

Fertility Management

Forage Economics

REGISTRATION DEADLINE IS FRIDAY, MARCH 20  
To pre-register, please contact  
Jenna Mosley  
601-683-2084 | jlt205@msstate.edu

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