

SOIL CLASSIFICATION AND LAND TREATMENT

SECTION ONE FACTORS TO CONSIDER IN CLASSIFYING SOILS

Things are classified as a short cut method of describing them. If you are asked about your car, you do not say it is a small car less than 12 feet (3.66 meters) in length with a small engine, etc. You probably say, "Oh, it's a compact." Most people know that cars are now roughly classified as "compacts" or "standards." All compacts have similar characteristics. Compared to standard models, they are small, have small engines, get good gas mileage and are less expensive. Since most people are familiar with the term compact, we simply say, "My car is a compact." Thus, classification provides a short cut method of communication.

Soils are classified for the same reason. Just as cars are classified according to similar traits, soils are grouped by similar characteristics. Soils with similar texture, permeability, drainage, slope, etc., are grouped together into a single class.

Things are classified, then, according to similarities or differences. And this classification saves time. People who work with soils speak of soils as being in a certain class, for example, Class III. A farmer may say, "I have a piece of Class IIIw land over near the river." Other farmers, familiar with land classification, would then have a good idea of the characteristics of this soil. They would know that this is nearly level or flat land with poor drainage; rapid, moderate, or slow permeability; and is a deep moderately deep soil. It requires drainage for crops and pasture. Drainage is the main problem in using this land. Bottomlands subject to occasional overflow may occur in this subclass. So, the ability to classify soils is a very important competency (skill). If you are to talk with farmers or other people who work with soil you need to understand their language.

Soils are always described in a moist state.

TEXTURE

What is soil texture?

To understand the idea of texture you must know that soil composed of rock particles, organic matter, air and water. The rock particles are grouped into convenient size groupings called the sand, silt and clay separates. The proportional amounts of each of these separates determine the overall "feel" or texture of the soil. Therefore, texture means the relative proportions of sand, silt and clay in a soil material.

The surface layer texture should be determined by examining a soil sample from the first 6 inches (15.2 cm) of the A horizon or the entire A horizon if it is less than 6 inches (15.2 cm) thick. Soils

with more than 20 inches (50.8 cm) of a coarse surface texture will usually be in subclass "s." Some soils with 20 inches (50.8 cm) or more of a sandy surface layer will be in subclass "w" if fair to poor drainage is present.

How is soil texture determined?

Texture is determined by rubbing and feeling the soil between the thumb and fingers. The soil should be moist when determining texture.

- Sand tends to make soil gritty.
- Silt tends to make the soil feel floury.
- Clay tends to make the soil sticky and slick when moist but harsh and hard when dry.
- Loam contains sand, silt and clay but it feels neither very sticky nor very gritty.

Coarse texture - Soils which feel very gritty because they contain mostly sand. (sand or loamy sand).

Light texture - A mixture of mostly sand, some silt and clay. Feel mostly gritty (sandy loam).

Medium texture - Mixture of sand, silt and clay (loam, silt loam, silty clay loam, or sandy clay loam).

Fine texture - Soils contain enough clay to make them feel sticky (clay loam, silty clay, sandy clay, or clay).

What is desired texture?

The ideal texture is light or medium. This texture allows proper balance of nutrients and water holding capacity coupled with adequate aeration, drainage, and workability.

Suggested Learning Activity

You may wish to conduct or observe a demonstration showing the separation of soil particles. If so, proceed as follows:

Pour a cup of water into a pint jar. Then put in ½ cup of soil. Put a cover on the jar and shake it for about 30 seconds. Let it stand until the soil settles. Can you see layers of mud in the jar? Can you see a layer of clay? A layer of sand? Write the names of layers of soil (Most of the sand particles will settle in about 1 minute; silt particles will settle in about 5 minutes; clay particles will take much longer to settle. After sand and silt have settled perhaps you can pour water containing clay into another jar and allow the clay to settle.)

Why is texture important?

Texture or particle size, as mentioned earlier, to a large extent determines the character of a soil. The larger the soil particle size, the less tightly it will stick together. Therefore, air and water can more easily enter and move through the soil. This means that less water is held by the soil. And this means that such soils will dry out faster after a rain. The fact that these soils tend to dry out faster may

mean that they “warm-up” earlier in the spring. This is true because it takes fewer calories to warm soil than it does to warm water.

Another characteristic (trait) of coarse soils is that they contain less nutrients (mineral elements, e.g., nitrogen, phosphorus, potassium, magnesium, etc.). This is because they have less surface area than soils composed mainly of small particles such as clay. Why is that? Think of it this way. An apple has a certain amount of surface. Suppose you cut the apple into half. You have now increased the amount of surface. And, suppose you cut each half into quarters. You have again increased the amount of exposed surface area. It is obvious that the more you cut the apple the smaller each part of the apple becomes, but the greater the surface area becomes. And so with a soil particle. The smaller the soil part the more surface area is exposed and the more surface on which nutrients such as magnesium, potassium, etc., can be attach. Likewise, it can attach more water molecules.

It is obvious then that texture is one of the most important, characteristics of soils. Through its effect on soil consistency (how it clings together), it affects tillage. Generally, the coarser a soil is, the looser it is. The looser the soil, the easier it is to plow the more rapidly and easily water passes through it, and the more nutrients are dislodged from the soil particle. Since potash is very loosely attached to the soil particle, it is especially apt to leach (be dislodged) from coarse textured soils. Coarse soils are usually lowest in most plant nutrients. The more desirable soils contain a variety of particle (separate) sizes.

Since coarse soils are loose, plant roots can easily penetrates the soil. This is good in the case of crops with low moist requirement such as Coastal Bermuda and Bahiagrass. It is not good for other crops which require more moisture.

The opposite is true of the finer textured soils. They absorb water more slowly but hold the water absorbed. Water does not pass through these soils easily, and nutrients are not easily dislodged. Since these soils are tighter, they are more difficult to plow. They dry more slowly after a rain and warm up more slowly in the spring.

Thus, the texture of a soil determines largely:

- The rate at which water can enter the soil
- The water-holding capacity of the soil
- The rate at which plant nutrients leach
- The kind of crops which can be grown
- The method of tillage
- The rate of movement of soil by erosion agents.

How does texture influence farming?

The following information indicates how texture affects farming:

Coarse and Light Textured Soils:

- Leach rapidly, surface dries out quickly
- Are usually low in plant nutrients
- Require frequent but light applications of plant nutrients

- Are easy to work, can be plowed soon after a rain
- Usually require extra potash
- Are not well adapted to clover and most legumes and grasses (except Sericea, Coastal Bermuda, and Bahiagrass).

Medium and Fine Textured Soils:

- Absorb water more slowly than light soils
- Hold more water than light, sandy soils
- Contain more plant nutrients
- Are more difficult to work
- Are better suited to grasses and legumes than the lighter soils.

What can be done to improve the unfavorable effects of texture?

Soil texture cannot be changed, but we can modify (change) the effect of texture by adding organic matter (decaying plants or animals).

SUBSOIL PERMEABILITY

What is permeability?

Permeability refers to the movement of water and air in the soil. It may be expressed as rates of percolation. This means the amount of water (inches per hour) that is able to move downward through the soil. Permeability may vary within layers of a given subsoil. For example, the first 6 inches (15.2 cm) might have good permeability whereas the next 4 inches (10.2 cm) might have slow permeability. Note, however, that it is the most restrictive layer which determines permeability. However, a few soils have a hard pan, which is the most restrictive layer. In soil classification you are mainly concerned with the permeability of the subsoil because the rate of water movement through the soil has a definite influence on its productiveness.

Suggested Learning Activity

You may wish to conduct or observe the following demonstration.

Tie or tape cheesecloth over one end of each of three open glass cylinders. Fill the first container three-fourths full of dry clay, the second with sand, and the third with loam containing humus. Pour one-half pint (.237 liters) of water into each at the same time. Compare the length of time for percolation and the amount of water that passes through.

What soil characteristics indicate permeability?

There are several clues to the permeability of a soil. One is texture. The smaller the separate (particle) size the tighter the soil hangs together, so the slower the rate of permeability. But this not always true because these separates (particles) often have themselves together differently. In other words they form aggregates of different sizes and shapes or the particles form different structures.

Structure is sometimes classified as blocky, platy, granular or single grained. Structure, then is second clue to permeability.

So you cannot depend on texture alone for determining permeability of a soil. Besides, soils are usually made up of mixture of particles of various textures. The aggregates (combination of particles) and the structure formed by the aggregates may give better clues to permeability.

You can tell something about permeability by breaking lump of soil. Lumps of soil, which is relatively easy to break, is usually from soils with good permeability. Also soils with good permeability have a large number of pores (empty spaces).

Permeability affects the quality of the entire soil, but is thought of most often in relation to the subsoil. Most soils used for row crops have a layer of relatively coarse soil on top. The firmer textured particles are leached (moved) to the lower levels water. Therefore, the topsoil is relatively loose and permeable compared to the finer textured subsoil. So, in a typical soil used for growing row crops, the concern for permeability is with the subsoil. And, remember that the permeability of a soil is determined by the most restrictive layer.

What is the desired subsoil permeability?

The ideal subsoil permeability for most plants is moderate. It should permit plant roots, water and air to move readily in the soil and hold sufficient water between rains or irrigations.

How is permeability expressed?

Degrees of Permeability:

Slow - Very sticky or very plastic clay subsoils. Few pores are visible.

Moderate - Slightly sticky clay to sandy clay loam subsoils; well defined nut like structure; visible pores of varying size.

Rapid – Light-textured (sandy loam) subsoils, with coarse granular structure; pores large and numerous.

Very Rapid - Coarse textures (sand and loamy sand) throughout the entire exposed soil profile.

Rate of Permeability:

Slow - less than 0.6 inches/hour

Moderate - 0.6 - 2 inches/hour

Rapid - 2 - 20 inches/hour

Very Rapid - more than 20 inches/hour

How does soil permeability affect erosion?

Soils which have very tight subsoils of low permeability erode (wash away) easily. Why - because soils which have a slow rate of percolation (water moving downward) cannot absorb heavy rainfall. Consequently, water runs off as soon as the surface soil is saturated.

Summary

Several characteristics indicate permeability:

- Texture of subsoil
- Type of subsoil structure (shape of soil aggregates)
- Ease of natural breakage
- Size and number of visible pores
- Amount of organic matter.

ROOTING DEPTH

Rooting depth refers to that part of the soil profile that roots can penetrate. Ranges in rooting depth are:

Deep	40 inches or more	(approx. 1 meter)
Moderately deep	20 to 40 inches	(approx. .5 - 1 meter)
Shallow	10 to 20 inches	(approx. .25-.5 meter)
Very shallow	less than 10 inches	(approx. .25 meter)

Why is rooting depth important?

The productive ability of land largely depends upon its rooting depth of soil. A deep-bodied beef animal has the ability for high beef production. A dairy cow with a large barrel has great capacity for food and water, which are necessary for high production. Likewise, deep soils are necessary to provide the needed water and nutrients for favorable plant production.

Deep soils have the capacity for more plant nutrients and water and provide a large area for root development. Shallow soils have a limited capacity for plant nutrients, water, and root development.

How does the depth of soil affect the use of the land?

Shallow soils are not well adapted to deep-rooted crops and those crops requiring large amounts of moisture.

Terraces are not ordinarily used on soils with thick, sandy surface layers. This is because thick soils are usually coarse soils and terraces built of coarse soils are easily washed away. Strip cropping or contour farming may be more effective in preventing erosion on these soils.

What is the ideal soil rooting depth? The ideal soil rooting depth is 40 inches or more.

SLOPE

What is soil slope?

Slope is the number of feet fall in each 100 feet (30.3 meters) measured horizontally in the direction of the steepest slope. Slope is very important in identifying soil since it influence erosion, conservation practices, and the use of the land. Slope expressed as follows:

Degree of Slope	Slope Classification	Number of Feet Fall Per 100 Feet (30.48 meters)	
		Feet	Meters
Nearly level	A	0 to 2	0 to .61
Gently sloping	B	2 to 6	.61 to 1.8
Sloping	C	6 to 10	1.8 to 3.0
Strongly sloping	D	10 to 15	3.0 to 4.6
Moderately steep	E	15 to 25	4.6 to 7.6
Steep	F	25 to 40	7.6 to 12.2
Very steep	G	above 40	above 12.2

What is the relation of slope to erosion?

With the same cover conditions, losses from erosion usually become greater as the slope of the land increases. As the land becomes steeper a greater percentage of rainfall is lost as runoff. The carrying capacity of the runoff water increases rapidly as the slope becomes greater. It is estimated that by doubling the speed of water, its ability to move particles is increased 64 times; its capacity to carry material in suspension is increased 32 times; its total erosive power is four times greater.

Suggested Learning Activity

You may wish to observe the effectiveness of strip cropping. If so, proceed as follows:

Make a box about 30 inches x 30 inches x 4 inches (.76 x .76 x .11 meters) with one side lacking. Fill with topsoil and pack firmly. Plant grass seeds in strips about three inches wide (7.62 cm), leaving a three-inch strip (7.62 cm) of bare soil between each strip of grass. When the grass has grown to about two inches (5.08 cm), sprinkle water over the box of grass first in a level position, then at a slight angle, and finally at a steep angle. Explain what happens in each case.

How does slope affect the use of land?

Slope must be considered when deciding what crop to grow on the land and how soil and water losses may be prevented.

Suggested Learning Activities

You may wish to conduct or observe one or both of the following demonstrations.

Raindrop Splash and Raindrop Erosion — Fill tin cans with soil. Level off the soil at the top and place a coin on the surface of the soil. Produce a hard, beating artificial rain with spray can. Notice

how the coin protects the soil; the raindrop splash produces erosion all around the outside of the coin on the level soil.

Plant Cover Prevents Erosion — From your school yard or nearby roadside collect two bucketfuls of bare soil. Empty the buckets of soil into two piles on a large piece of plywood or large flat board (approximately 4 feet x 3 feet (1.2 x .91 meters)). Steel or aluminum sheets may also be used for this purpose. Shape each pile of soil into a mound. Tilt each board to form a gentle slope. To one mound of soil, apply an organic covering such as straw, sawdust, peat moss, leaf mold or clipped grass. By means of two sprinkling cans with one gallon of water in each, apply the same amount of artificial rain to each pile of soil. Observe how much soil is washed from the unprotected mound as compared with the mound having protective cover. This demonstration can be performed on a much more, accurate basis by weighing each soil sample and collecting and measuring runoff from each sample.

EROSION

What is erosion?

Erosion refers to the loss of soil by water and wind. Water erosion causes the greatest damage in this state; however, wind erosion may frequently be a problem in the Coastal Plain. Water erosion is designated as sheet erosion, rill (small gully) and gully erosion.

You may wish to conduct or observe the following demonstration showing wind erosion.

Wind Erosion - Use electric fan or vacuum cleaner attachment to show how wind will blow unprotected soil. A sample of bare soil and one of protected soil with straw or grass will show how unprotected soil erodes and how surface cover prevents the soil from blowing away. Use pine or brush twigs (6 inches - 7 inches high) (15.2 cm - 17.8 cm) to build miniature windbreaks on the unprotected soil.

What are the effects of erosion?

Some effects of erosion are:

- Loss of organic matter and plant nutrients
- Loss of soil particles
- Smaller crop yields
- Less water-holding capacity of the soil
- Increased cost of tillage
- Reduction of the benefits from fertilizers

The topsoil (the "A" horizon or surface layer) is considered the life of the land. This is the first part of the soil to be lost by erosion. The original topsoil of the Piedmont and Upper Coastal Plain of South Carolina was approximately nine inches (22.9 cm). Today it is about six inches (15.2 cm) or less. This means, on an average, that we have lost about one-third of our surface soil. In many places, all of the topsoil is gone.

Suggested Learning Activity

You may wish to observe the effects of soil erosion on plant growth by setting up the following demonstration:

Obtain two buckets or jars. Fill one with good topsoil, the other with soil from an eroded area or the bank of a gully or road cut. Plant a few seeds in both containers. Use the same amounts of water in each.

Why is erosion more damaging on some soils than on others?

Erosion is considered a hazard (major factor) on all "e" land. It is also a major factor on "s" land with a slope of more than 6 percent.

Several factors determine the seriousness of erosion on soils:

- Land cover. Soils under sod lose little water and erosion is greatly decreased.
- Thickness of the topsoil. Naturally the loss of a given amount of topsoil is more serious on a 6-inch (approximately 15 cm) topsoil than on one of 1 2-inch (approximately 30 cm) depth.
- Nature of the subsoil. This includes the workability, structure, fertility and water-holding capacity of the subsoil or B-Horizon.
- Depth of soil.

How is erosion described?

Colluvial (deposits from nearby slopes) or Alluvial (stream deposits).

None to slight - less than 25 percent of the original topsoil removed; no gullies.

Moderate - from 25 percent to 75 percent of topsoil lost, with or without gullies; no deep gullies.

Severe - 75 percent to 100 percent of topsoil lost; may have occasional deep gullies.

Very severe - all of the topsoil lost and up to 25 percent of subsoil lost; may have frequent deep gullies.

Very severe/gullied - badly gullied land; cannot be used for crops or pasture.

Note: If alluvial or colluvial is marked in Section B. on the score card, do NOT mark erosion as a major factor in Section G.

How can we prevent erosion?

To prevent erosion we must:

- Know the physical characteristics of our soils.
- Be able to determine the proper land use and needed conservation measures.
- Have the ability to apply the needed treatments to the land.
- Know what crop or crops the land is best suited for.

DRAINAGE

Why is soil drainage important?

Drainage refers to the presence or absence of excess water in the soil for varying lengths of time. For best production, soils must have a proper balance of water, air, organic matter, soil particles, bacteria and animal life. Soils must have adequate drainage to have necessary air space, bacteria, and animal life. Soil air plays an important part in aiding the breakdown of organic matter, releasing plant nutrients, and supplying the necessary oxygen. Too much water in the soil reduces the air content and prevents or retards these chemical changes. Since roots need air, they grow shallow in poorly drained soils. This may result in drought damage later in the season due to the shallow root development.

How is drainage indicated?

One of the main indicators of drainage is the color of the subsoil. Soil color is due to the presence of iron and aluminum (many forms) and organic matter. The term mottling is frequently used in discussing soil drainage. Mottling refers to color spots in the subsoil. Mottling of gray in the soil profile indicates poor aeration, which is caused by too much soil water. Brighter yellowish or reddish color, with little or no mottling, indicates better aeration through proper drainage.

How are different degrees of drainage described?

In studying and identifying soils, we score the drainage of a particular field or area in terms of very poor, poor, fair, good, and excessive. These are the terms used on the scorecard.

Drainage Classes for FFA Soil Judging,

Very Poor Drainage - Very poorly drained soils are black to a depth of 10 inches (approximately 25 cm) or more, and subsoils are solid gray or may have a few mottles of yellow, brown, or red. Water stands at or near the surface for long periods of time. Water control is often difficult and pumping may be required in a drainage system for the removal of excess water. The number of crops adapted to these soils is very limited.

Poor Drainage - Poorly drained soils have subsoils that are dominantly gray with mottles of yellow, brown, or red. These soils require drainage for the production of crops. Some of these soils especially those of the Lower Coastal Plain, are adapted to a variety of crops while others are adapted to only a few crops.

Fair Drainage - This includes soils, which are somewhat poorly drained and those moderately well drained. Somewhat poorly drained soils have subsoils that are dominantly yellow or brown with a few gray mottles in the upper part and dominantly gray in the lower part. Drainage is needed for the production of adapted crops. Moderately well drained soils are oxidized and free from mottling in the upper part of the subsoil, but have gray mottles within 30 inches (.76 meter) of the surface. Crops growing of these soils may suffer from an excess of water during wet spells. It may be necessary to furnish artificial drainage for normal yields of certain crops.

Good Drainage - Soils with good drainage are well oxidized and free from gray mottling in the soil to a depth of 30 inches (.76 meter). Gray mottles may be present below 30 inches (.76 meter). This is the ideal soil drainage condition.

Excessive Drainage - This refers to soils which are coarse textured throughout their entire exposed soil profile, and have subsoil colors which indicate good aeration—red, brown, and yellow; or combination of red, brown, and yellow. Excessive drainage means that water escapes from the soil too rapidly as in deep sand and loamy sand with a reddish, brownish, or yellowish colored subsoil. The addition of organic matter aids in reducing the effects of excessive drainage.

How is flooding expressed?

Flooding is frequently a problem especially on lands near streams or rivers. Severity of flooding is described by degrees as follows:

- Occasional Flooding - less often than once in 2 years
- Frequent Flooding - more often than once in 2 years
- Duration of Flooding:
 - Very Brief - less than 2 days
 - Brief - 2 to 7 days
 - Long - 7 days to 1 month
 - Very Long - more than 1 month

SECTION TWO LAND CAPABILITY CLASSES

All land is grouped into eight capability classes. In Section One you learned some characteristics used to differentiate soils — texture, permeability, drainage, slope, erosion, depth of topsoil and subsoil.

Soils are grouped into capability classes according to the number and severity (seriousness) of limitations or hazards. Class I soils have no limitation of use. These soils can be put into row crops; they can be put into pasture; they can be used for growing trees; they can be used for wildlife or recreation. But Class VIII soils have very severe limitations. They can be used only for recreation or wildlife. Land is classified, then, according to its capacity to be used (capability). And this capability is based on the number and severity of limitations.

What are these limitations upon which classes are grouped? Actually any of the six soil characteristics you can directly or indirectly impose a limitation. A very thin soil imposes a serious limitation. Obviously the thinner the soil the more difficult it will be to grow plants. In the case of soil thickness, the degree of limitation is usually directly related to the thickness of the soil. Slope can also be a limitation, and again the degree of the limitation due to slope is directly related to severity of slope. For example, when the angle of slope becomes greater than 25% it would be hazardous to try to use the land for anything other than forestland. Poor drainage or coarse textured, thick topsoils can also impose serious limitations to land use. The higher the class of land the greater the number or severity of limitations or hazards.

Land is further classified into subclasses. The subclasses recognized in South Carolina are as follows: Subclass (e), subclass (w), and subclass (s). These subclasses may occur in all classes of land except Class I. The letters indicating subclass have a definite meaning - (e) represents erosion; (w) means wetness; and (s) indicates a sandy or stony soil condition. The subclass, then, tells us the major kind of limitation or hazard. For example, Class IIe means that the land is suitable for cultivation with certain conservation practices and erosion is the major hazard. Where soil conditions are such that two or more hazards or limitations exist that are essentially equal, the "e" (erosion) hazard takes precedence over "w" or "s" conditions, and "w" takes precedence over "s" conditions in deciding the subclass. In other words, if a Class II soil is equally eroded and wet, its subclass would be "e" -Class IIe. If a Class II soil is equally wet and sandy, it would be classified as Class IIw. Land then is first classified by size or degree of limitation or hazard. It is further classified by its major type or kind of hazard. A full description of the classes and subclasses of land follows.

LAND CAPABILITY CLASSES

Suitable for Cultivation

- I Requires good soil management practices only
- II Moderate conservation practices necessary
- III Intensive conservation practices necessary
- IV Perennial vegetation—Infrequent cultivation
- No Cultivation—Pasture, Hay, Woodland and Wildlife
- V No restrictions in use
- VI Moderate restrictions in use
- VII Severe restrictions in use
- VIII Best suited for wildlife and recreation

CLASS I - This land is nearly level and deep, with light or medium surface layer texture, or with a coarse surface texture if it is less than 20 inches thick. It has moderate permeability, good drainage, none to slight erosion, or it may have colluvial deposits. This is good, productive land that can be safely cultivated with ordinary farming methods. It can be cultivated every year and kept in good condition by adding the needed fertilizer, lime, and organic matter. It is not subject to overflow.

"E" SOIL CLASSES

Subclass IIe - This land is gently sloping, deep or moderately deep, with none to slight or moderate erosion, moderate or slow permeability, light or medium surface layer texture, or with a coarse surface texture if it is less than 20 inches thick. It has good or fair drainage. An occasional galled spot may be present. It requires terraces or contour strips, contour tillage, grassed waterways, and crop rotations when used for cultivated crops.

Subclass IIIe - This land is gently sloping with severe erosion; or sloping with none to slight or moderate erosion; deep or moderately deep with moderate or slow permeability; light or medium surface layer texture or with a coarse surface texture if it is less than 20 inches thick. It has good

drainage. More galled areas occur than in subclass IIe. The plow layer is often a mixture of topsoil and subsoil. It requires terraces, contour cultivation grassed waterways, and crop rotation when used for cultivated crops. Erosion is the main problem on this land.

Subclass IVe - This land is gently sloping with very severe erosion, sloping with severe erosion, or strongly sloping with none to slight or moderate erosion; deep, moderately deep, or shallow with moderate or slow permeability; and good drainage. This subclass is best suited to pasture or trees.

Subclass Ve - There is no subclass Ve recognized in South Carolina.

Subclass VIe - This land is sloping with very severe erosion, strongly sloping with severe erosion, or moderately steep with none to slight or moderate erosion; deep, moderately deep, or shallow with moderate or slow permeability. Much of this land is in trees and should remain in trees. If it is cleared, it should be plowed only to prepare a seedbed for a permanent sod.

Subclass VIIe - This land is strongly sloping with very severe erosion, moderately steep with severe or very severe erosion, or steep or very steep with any degree of erosion. This soil may be deep, moderately deep, shallow, or very shallow. It is best suited to trees. Some conditions may justify pasture or perennial legumes. Extreme caution should be used to maintain vegetative cover at all times.

Subclass VIIIe - There is no subclass VIIIe recognized in South Carolina.

"W" SOIL CLASSES

NOTE: Always be aware of wetland issues and regulations before doing any drainage work on wet soils!

Subclass IIw - This is nearly level or flat land with fair drainage; moderate or slow permeability; and deep or moderately deep soil. It requires some drainage for crops and pasture, and requires the same rotations as Class I land. Bottomlands subject to occasional overflow may occur in this subclass.

Subclass IIIw - This is nearly level or flat land with poor drainage; rapid, moderate, or slow permeability; and deep or moderately deep soil. It requires drainage for crops and pasture. Drainage is the main problem in using this land. Bottomlands subject to occasional overflow may occur in this subclass.

Subclass IVw - This is nearly level or flat land with very poor drainage; rapid, moderate or slow permeability; and deep or moderately deep soil. Water stands at or near the surface for long periods of time and it may be subject to frequent overflow. It best suited to pasture, hay, or trees. If used for pasture or hayland drainage is necessary.

Subclass Vw - This is flat, very poorly drained land. Because location and soil conditions, it is not feasible to drain and use the land for crops. It may be subject to frequent overflow. It is best suited to pasture or trees. Special drainage is required for the development of productive pastures.

Subclass VIw - This is nearly level or flat, wet land with water at or above the surface for very long periods of time. It is best suited for pasture or trees. Intensive drainage is required for the development of productive pastures.

Subclass VIIw - This is flat, permanently wet, swampy land which is covered with water most of the time. It is not practical to drain this land. It is best suited to cypress and hardwood trees at wildlife areas.

Subclass VIIIw - This is salt water tidal marsh suitable only for wildlife.

"S" SOIL CLASSES

“S” subclasses will have a coarse surface layer texture that is 20 + inches thick.

Subclass IIs - This land is nearly level or gently sloping, deep or moderately deep, moderate or slow permeability, none to slight erosion, good drainage, and coarse surface layer texture that is 20 to 40 inches (50.8 - 101.6 cm) thick. It requires special soil and moisture conserving practices as well as fertilizer practices. This subclass is subject to leaching and blowing in dry windy seasons. Not over half of this land should be in row crops during any one year rotation. NOTE: Terraces are not recommended on subclass "s" land. Use parallel strips, contour cultivation, and grassed waterways in draws.

Subclass IIIs - This land is nearly level or gently sloping, deep with rapid permeability, coarse surface layer texture that is more than 40 inches (101.6 cm) thick, none to slight erosion, and fair or excessive drainage. This subclass includes sloping soils with a coarse surface layer texture that is 20 to 40 inches (50.8 - 101 .6 cm) thick, deep with moderate or slow permeability, and good drainage. It requires more intensive soil and moisture conserving practices than IIs. This subclass is subject to severe leaching and blowing in dry seasons.

Subclass IVs - This land is nearly level or gently sloping with very rapid permeability, or sloping with rapid or very rapid permeability, coarse surface layer texture that is more than 40 inches (101.6 cm) thick, none to slight erosion, deep, and excessive drainage. This subclass also includes gently sloping, very stony land with none to slight erosion, and moderate permeability. Row crops are not recommended; best suited to trees or perennials.

Subclass Vs - There is no subclass Vs recognized in South Carolina.

Subclass VIs - This land is strongly sloping with rapid or very rapid permeability, deep, coarse surface layer texture that is more than 40 inches (101.6 cm) thick, none to slight erosion, and excessive drainage. This subclass also includes sloping or strongly sloping, very stony land, with none to slight erosion. Suitability is limited to pasture, trees, or wildlife cover.

Subclass VIIs - This land is moderately steep, steep, or very steep very sandy and droughty, or very stony. Suitable only to trees wildlife.

Subclass VIIIs - This includes rock outcrops, extremely stony land, and beaches. Suitable for wildlife, recreation, and commercial purposes.

LAND TREATMENTS

Use:

1 Cultivated Cropland - This will be used when the farmer desires to put this acreage in cultivated crops or rotate cultivated crops with soil-conserving crop.

2 Pastureland - This is recommended on land not suitable for row crops due to soil condition, slope, or erosion; also where pasture could be used to a better advantage than a hay crop or timber products. The area may be ideally suited for pasture due to location or needs of the farm.

3 Hayland (Perennials) - Use this practice on land where soil is not suited for row crops due to soil condition, erosion, or slope; also where a hay crop would be more practical than pasture or where pasture grasses are not adapted.

4 Forestland - This practice is recommended where the area is not suited for row crops due to slope, erosion, or soil condition; where pasture or hay is not adapted or needed; and where trees are adapted—also where erosion control is the primary objective and intensive treatment is warranted.

5 Wildlife Land - This is recommended for land on which the primary land use is to provide habitat for wildlife.

Vegetative:

6. Conservation Crop Rotation - Use a crop rotation on cultivated fields which includes a combination of crops that will minimize pest problems and that includes sod crops, cover crops, and high residue crops, as needed, to control soil erosion and enhance soil quality. This practice will always be used on cultivated cropland.

7. Establish Strips for Wind Erosion Control - Use this where the surface is coarse-textured (sand or loamy sand), and where the open area is 40 acres or more in size. It is also used where crops are not adapted to conservation tillage (tobacco, truck crops, etc.).

8. Do Not Burn Crop Residue - Burning crop residue is always discouraged.

9. Conservation Tillage - Use minimum tillage equipment to provide protective cover by leaving crop residue of any previous crop as a mulch on or mixed in the surface plow layer of the soil. The practice includes no-till and minimum-till. The purpose is to prevent erosion and/or improve soil

health. Use this on all classes of cultivated cropland, except those crops not adapted to conservation tillage (tobacco, truck crops, etc).

10. Plant Wildlife Food Strips and/or Plots - Use this practice on ditches, roads, and along edges of cultivated fields. In addition to providing food and cover for wildlife, it provides turning space for equipment, reduces erosion from row and terrace drainage, and discourages farmers from having turn rows up and down the hill. Also open plots should be used in wooded tracts that are over 300 feet from edge of cropland fields.

11. Conservation Buffer - This practice involves the establishment of a buffer of trees or grasses, as applicable, 20 to 100 feet in width along streams, ditches, and ponds adjacent to cropland, pastureland, or hayland to protect water quality by stabilizing the riparian zone and filtering runoff.

12. Re-establish Pasture & / or Repair - This practice is recommended on permanent pasture or perennials where the present grasses are not desirable species and / or where a sod of permanent grass has become thin and where it is desirable to thicken the sod. Re-establishment may be done by plowing and reseeding or by killing existing vegetation with herbicides and reseeding using conservation tillage method. Thickening sod can be accomplished by harrowing and seeding or by conservation tillage method.

13. Mow or Spray Pasture or Perennials for Weed Control - This practice is required on new pastures and perennials and is also used on established pastures and perennials where weeds or brush (less than 2 inches in diameter) are found.

14. Topseed Winter Annuals on Pasture - This is often recommended on permanent summer grasses where additional winter grazing is needed.

15. Control Grazing - This system of grazing will maintain or improve desirable vegetation in pastures. It includes cross fencing and rotational grazing.

16. Thin Trees Selectively - This is practiced when the stand needs thinning to encourage growth, to remove damaged or diseased trees, or where part of the stand may be mature and should be cut to prevent loss.

17. Clear-Cut and Plant to Trees - Clear-cutting is an operation where all the trees are cut on an area that is to be regenerated. Clear-cutting is recommended in the following stands: (1) even-aged containing mature or over-mature trees, or (2) undesirable species that should be replaced by desirable ones, or (3) trees of any age that are beyond recovery because of damages caused by fire, insects, ice, or other causes. All practices will be done to replant the acreage.

18. Pest Management - Use the principles of prevention, avoidance, monitoring, and suppression (PAMS) to minimize problems with pests on land used to produce crops, including forage. (Cropland, Pastureland, and Hayland)

19. Planting of Native Grasses, Legumes, and Shrubs - Use this practice on wildlife land where cover is needed for nesting and escape habitat and/or where additional permanent vegetative cover is needed to insure a consistent food source.
20. Early Successional Habitat Development/Management - Use this practice where a 2 or 3 yearly rotational disking is desired to encourage various stages of successional plant development to provide nesting and brooding areas for upland birds such as quail.
21. Hedgerow Establishment - Use this practice to provide corridors for wildlife movement, cover and food on open fields that are more than 30 acres and which will have a primary or secondary land use as wildlife habitat.
22. Tree Planting for Wildlife Habitat - Use this practice for planting of fruit and nut producing trees in open fields or in existing pine forests for wildlife land where wildlife species of concern are deer, turkey, and/or furbearing species.
23. Thinning of Forestland for Wildlife Habitat - Use this practice where the primary land use is to provide wildlife habitat and where the existing tree cover is too dense for an understory cover of grasses and legumes to develop.

Mechanical:

24. Farm on Contour - This practice is to be used on all cultivated land not requiring terraces but with a 1- to 6-percent slope, or on soils with a coarse surface texture that are not to be terraced.
25. Terrace and Farm on Contour - Use this on cultivated land on slopes greater than 4% except in soils with a coarse surface texture that are used for cultivated cropland.
26. Establish Grassed Waterways - This is used where land is farmed on contour or requires terraces.
27. Establish Drainage System - This may be either open-ditch drainage or tile drainage. Drainage is recommended on all "w" classes of land used for row crops, permanent pasture, or perennials. Also recommended for wooded tracts in classes 3w or 4w. Note for teaching purposes: Always be aware of wetland issues before doing any drainage work!
28. Provide Water Facilities for Livestock - Use this practice when there is no water available in the pasture. A pond is considered a source of water for livestock.
29. Establish Fire Breaks - Use this where the tract of woods is in a high fire hazard area, for example, railroad, high traffic road, incinerator area, etc.
30. Control Brush or Trees - This is used in pastures or perennials and also in stands of timber to remove brush (greater than 2 inches in diameter) or cut trees that are preventing the growth of more desirable plants. This may be done by spraying with chemicals and/or using machinery. It improves

the desirable vegetative cover by removing or killing undesirable brush or trees. Do not use when brushy growth can be controlled by normal farm mowing.

31. Control Burn - Use this to control small hardwoods (10 feet tall or less) and reduce litter/fuel buildup.

32. Streamside Management Zone - Use this practice on forestland with streams and on which harvesting or thinning is planned. This treatment includes measures such as selective harvesting, hand planting, and removal of debris from stream channels to preserve water quality.

Lime and Fertilizer

33. Apply Limestone - This practice is recommended on pasture, perennials, and cropland where the pH is below 5.8. The pH of the soil is given in a soil-judging contest.

34. Apply Nitrogen - Use this practice on newly planted pasture grasses or perennials to stimulate growth, on established pasture and hayland that has few or no legumes present, and on cropland. This encourages early and continuous growth throughout the growing season.

35. Apply Phosphate - Use this practice on pastures, perennials, and row crops where soil test indicates the phosphorus level is medium or less. The soil test level is given in a soil judging contest.

36. Apply Potash - This practice should be used on pastures, perennials, and row crops where soil test indicates the potash level is medium or less. The soil test level is given in a soil-judging contest.

SECTION FIVE THE FFA SOIL JUDGING CONTEST

The FFA Soil Judging Contest provides an interesting means of developing a knowledge of soils. By participating in this contest you will be able to further develop your skills while competing for recognition, trips and prizes. Should your team become skilled enough, you may be able to compete at the state or national level.

The FFA Score Card is divided into two parts. Part I requires that you classify a soil by each of the major soil characteristics - surface texture, subsoil permeability, rooting depth, erosion, drainage, and slope. You must also select the land class and subclass. The total points possible on Part I is 30. Part II requires that you select the recommended land treatments for an additional 30 possible points.

This sheet provides information needed for determining the land class and for selecting recommended conservation practices.

MASTER SCORE CARDS AND FIELD CONDITION SHEETS

The following is an example of a master score card for Part I, Land Class Factors:

Factor	Correct Placing	Allowed Score
Texture	Light	3
Subsoil Permeability	Moderate	3
Depth of Surface Soil and Subsoil	Deep	3
Slope	Gently Sloping	4
Erosion	Severe	6
Drainage	Good	3
Major Factors	Slope and Erosion	2
Land Capability Class	IIIe	6
TOTAL		30 points

After the land capability class is determined, the soil judging participant again checks the condition sheet. The condition sheet below provides information for selecting the 12 recommended practices.

CONDITIONS OF FIELD
FIELD NO. 1

1. Assumed soil test. pH 5.3 Phosphate VL Potash MED .
2. Pay no attention to conservation practices on field.
3. Thickness of original topsoil was 10 inches.
4. Field to consider is 25 acres Cultivated.
5. Consider the (most intensive) (~~best~~) use of the land.
6. Other conditions are General farm-field borders a highway on one side and woods on another.
7. Use 12 practices in Part II.

*The term, "most intensive use," on the condition sheet means row crop rotations in Classes I, II, III, and IV or permanent pasture or perennials in Classes V, VI, and VII. The term, "best use," means permanent pasture, perennials or trees. Use will be dependent upon other conditions as stated in item 6 above.

The 10 correct practices and their appropriate scores would be:

Practice	Score
Cultivated Cropland	3
Conservation Crop Rotation	3
Conservation Tillage	3
Terrace (if slope is >4%) and farm on contour	3
Establish Grassed Waterways	2
Burn no crop residue	2
Pest Management	3
Plant Wildlife Food Strips and/or Plots	3

Apply limestone	2
Apply nitrogen	2
Apply phosphate	2
Apply potash	2
TOTAL	30 pts.

Using the same land capability class, IIIe, but a different condition sheet as seen below, the participant would select 10 practices appropriate to the land capability class and the conditions proposed for field No. 2 below.

CONDITIONS OF FIELD
FIELD NO. 2

1. Assumed soil test. pH 5.3 Phosphate VL Potash MED
2. Pay no attention to conservation practices on field.
3. Thickness of original topsoil was 10 Inches (25.4 cm).
4. Field to consider is 25 (approx. 10 hectares) acres cultivated.
5. Consider the (~~most intensive~~) (best) use of the land.
6. Other conditions are Beef cattle farm — No streams or springs within field.
7. Use 10 practices in Part II.

The nine correct practices and their appropriate scores would be:

Pastureland	3
Apply limestone	3
Apply nitrogen	3
Apply phosphate	3
Apply Potash	3
Re-establish Pasture & / or Repair	3
Mow or spray pasture or perennials for weed control	3
Pest Management	3
Control Grazing	3
Provide water facilities for livestock	3
TOTAL	30 points

TERMS USED IN CLASSIFYING SOIL AND IN

DETERMINING RECOMMENDED LAND USE TREATMENTS

Aeration - Refers to the amount of air in the soil.

Alluvial deposits - This is soil deposited by streams.

Annual crops - Crops that are seeded each year.

Border strip - Refers to planting the edges (strips of fields next to woods) in some close growing crop.

Choppy - Refers to an area of land which has a very irregular surface; usually numerous dome-like mounds of sand and clay.

Capillary action - The movement of water in the soil.

Colluvial deposits - This is soil deposited from nearby slopes.

Conservation - Means the wise use of soil, water, wildlife and forest.

Conservation practices - The best methods of managing soil and water.

Contour farming - Running rows on the level or with a slight amount of fall.

Crop residue - Plants or parts from the preceding crop left on the land.

Crop rotation - Planting crops in regular succession year after year on the same land.

Consistency - The way in which soil particles hold together.

Depth of soil - The distance from the surface to a root-limiting layer.

Drainage - Refers to the presence or absence of excess water in the soil for varying lengths of time.

Draws - Refers to low places, or small valleys in a field.

Droughty - Refers to well drained soils which have very sandy topsoil and subsoil.

Field moisture capacity - Refers to the amount of water held in a soil after all excess water has drained away.

Flooding, Duration: Very Brief - Less than 2 days; Brief - 2 to 7 days; Long - 7 days to 1 month; Very Long - More than 1 month

Flooding, Frequency: Frequent - More often than once in 2 years; Occasional - Less often than once in 2 years.

Galled - Areas from which much or all of the topsoil has been removed.

Gully erosion - A small gorge or valley caused by running water.

Hardpan - A hard, compact layer of the soil usually about plow-depth.

Hazards - Soil hazards refer to dangers or problems of a certain land area.

Horizons - Layers of soil are called soil horizons. The A horizon is the surface horizon; the B horizon is the subsoil; and C horizon is the parent material.

Humus - Dark colored material in the soil formed by the decay of animal and plant life.

Infiltration - The downward entry of water into the surface soil.

Land capability classes - All land is grouped into classes based on what it is best suited for and its needs.

Leaching - The loss of plant nutrients through the downward movement of water.

Legumes - Crops which have nodules on their roots and are able to gather nitrogen from the air.

Mottled subsoil - A mixture of several colors of soil in one area.

Overflow - Refers to areas of land which are covered with water due to rainfall.

Parent material - Mineral particles from which the soil is formed.

Perennial crops - Crops which come back from the roots each year such as alfalfa and sericea.

Pest - a weed, animal or disease that will limit the production, quality, and or harvest of a crop, including forage.

“PAMS” - Using the principles of prevention, avoidance, monitoring, and suppression to minimize problems with pests on land used to produce crops, including forage.

Prevention includes actions such as cleaning equipment between fields, using field sanitation procedures, and elimination of alternate hosts to keep a pest population from infesting a field.

Avoidance includes the use of good cultural practices such as crop rotation, resistant varieties, trap crops, nutrient management, rotational grazing, and selection of adapted varieties and planting dates to minimize pest problems.

Monitoring refers to scouting of fields and maintaining records of the occurrence and distribution of pest species in each field.

Suppression of pest populations may become necessary to avoid economic loss if prevention and avoidance tactics are not successful. Controls may be by mechanical, biological, or chemical means. If use of a pesticide is warranted, selection should emphasize toxicity to only the pest(s) species and minimizing environmental risks.

Permeability - Refers to the movement of water and air in the soil.

Plant nutrients - Elements which plants feed on, such as nitrogen, phosphorous, and potassium.

Rill erosion - Very small gullies caused by running water.

Rotated crops - Planting a different crop in a designated field each year or a number of years, such as a 3 year rotation. Rotated crops may consist of row crops each year (e.g., tobacco - soybeans - corn) or may be a combination of row crops and close growing crops (e.g., corn - wheat - soybeans).

Separate - Refers to the size of individual soil grains such as sand, silt and clay.

Sheet erosion - Refers to losing the soil in thin, sheet like layers.

Slope - Is the number of feet of fall in each 100 feet measured horizontally in the direction of the steepest slope.

Soil profile - A section of the soil which includes the topsoil, subsoil, and parent materials.

Soil series - Is a soil name given to a group of soils which have the same general characteristics throughout their profiles. Examples of different soil series are Cecil, Iredell, Norfolk, Coxville, etc.

Soil type - Is a combination of the soil name (series) and textural name of the surface soil such as Cecil sandy loam or Norfolk loamy sand.

Soil sample - A small portion of soil (pint or quart) used for testing to determine the need for lime and plant nutrients.

Structure - Refers to the way the soil grains are arranged to build aggregates, crumbs, and nut-like or blocky units in the soil.

Tillage - Preparing the soil for planting by plowing, disking and harrowing.

Tilth - Refers to the condition or workability of the soil.

Terrace outlet - Where the terrace empties surplus water.

Texture - Refers to the way a soil sample feels as determined by the proportions of sand, silt, and clay particles in the soil.

Vegetative cover - Refers to keeping the land in a crop of legumes, grasses or trees.

Wildlife area - Land which is set aside or planted to food crops for wild animals and birds.