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Land Judging Guide

Contents

Land Judging Guide

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The following information has been prepared to help teachers, students and others understand the basic differences in soils, and for use in training land judging teams. Judges are urged to closely follow the guiding material to insure uniformity at all levels of the contest.

Foreword

Joe Lancaster,
Tennessee Farmers Mutual Insurance Co.

The years of land judging history have taught us something:

First – the interest in knowing more about our priceless product. Interest in the soil is more far-reaching than most of us had ever anticipated. The number of young people participating has far exceeded our expectations.

Second – it's surprising what can be accomplished in terms of youth development when the involved agencies cooperate in a totally unselfish effort to achieve the goals of a project like the land judging program.

Third – it is equally surprising to see the satisfaction we adults are receiving from this program separate and apart from youth development. The cooperative spirit is an asset both individually for our respective agencies and companies, and collectively for the agricultural community which we all represent.

The Tennessee program is reported to be one of, if not, the best in the nation. Thanks to all of you who have helped earn that reputation – and thanks in advance for future contributions from those who will be participating.

Soil Texture

What Is Soil Texture?

Soil is made up of small mineral particles, organic matter, air and water. The small mineral particles are divided into three groups based on size. These groups are called sand, silt and clay. Soils usually contain a mixture of these three size groups. Soil texture is determined by the relative amounts of the three size groups in the soil.

The largest of the particles is called sand. Sand can be seen by the eye, without a microscope or magnifying glass. Sand gives the soil a gritty feel. Sand absorbs

Textural group	Textural classes	Description
Coarse (Sandy)	Sand Loamy sand	Will not form a ribbon. Feels very gritty because soil is mostly sand. Ball is loosely held together and falls apart easily when handled.
Medium (Loamy)	Sandy loam	Will not form a ribbon. Feels gritty, but contains considerable silt and clay. Ball will hold together when handled gently, but will break apart easily when pressed.
	Silt Silt Loam Loam	Will form a very short ribbon which breaks easily. Soil has smoother feel, like talc in a silt loam and with slight grittiness in a loam. Ball will compress only slightly before cracking when pressed. Slightly sticky when wet.
	Sandy clay loam Clay loam Silty clay loam	Will form a short ribbon which breaks easily. Ball will compress somewhat without cracking when pressed. When smoothed with finger nail or knife blade, will not leave a shiny surface. Sticky when wet.
Fine (Clayey)	Sandy clay Silty clay Clay	Will form ribbon easily which holds together well. Ball of moist soil can be molded into various shapes with little cracking. Will leave shiny surface when smoothed out with knife or fingernail. Very sticky when wet.

little water, and is not slick or sticky when wet.

The medium-sized particles are called silt. Silt particles are too small to be seen without a microscope. Silt causes the soil to feel like flour or talc. Silt absorbs a moderate amount of water. Silt is moderately sticky when wet.

The smallest particles are called clay. Most individual clay particles are too small to be seen with a light microscope. Soils high in clay are sticky and plastic when wet, and hard when dry. Clay is the chemically and physically active part of the soil. Clay absorbs a lot of water, holds and exchanges plant nutrients and acts as a binding agent between sand and silt grains in forming soil structural units.

Soil scientists have set up 12 classes of soil texture. For some uses, these fine divisions are important. But for most purposes, three groups of soil texture are enough, and only three are used in land judging. These three are: coarse, medium and fine.

How to Judge Soil Texture

Soil texture can be estimated by rubbing a moist sample of soil between the thumb and finger.

Wet a sample of soil until it has the consistency of putty or modeling clay. Make a ball of the wetted soil about 1/2 to 3/4 inch in diameter. Press the ball between the thumb and finger. Try to make a thin ribbon from it. Then estimate the texture using the guidelines on page 4.

Surface soil refers to the plow layer in cultivated soils, or the upper 7 inches in uncultivated soils. The plow layer is a darker colored upper layer that has been mixed by tillage. The subsoil is any soil below the surface soil. Samples for determining subsoil texture should be taken between 18 and 24 inches below the soil surface. If the soil is less than 24 inches to bedrock, then the sample should be taken from the middle of the subsoil.

Importance of Texture

Soil texture affects the rate of water absorption, water movement in the soil, how much water the soil can absorb, how much water the soil can provide to plants and how easily pollutants can leach into groundwater. Soil texture also affects ease of tillage, erodibility, fertilizer management and root penetration.

Texture is a soil property that affects many uses of the land and cannot be changed except at great cost. Therefore it is one of the most important factors in land judging.

Rooting Depth

Judging Rooting Depth

Rooting depth is the total depth of soil and parent material that will allow root penetration and growth through most of its volume. It is the depth from the land surface to soil or rock layers which either stop root growth or limit root growth to only a small part of the total volume. Layers which stop or severely limit root growth include bedrock, continuous fragipans, unconsolidated partially weathered parent material, structureless clay and compact layers of chert or gravel. A fragipan is a dense, compact layer of medium-textured soil that is hard when dry and brittle when moist in most of its volume.

A few roots may be found growing in cracks in some types of root-limiting layers. However, because roots cannot penetrate the area between the cracks, they are not very effective in getting water or nutrients from the layer. If root growth in a layer is confined to cracks several inches apart, the layer is considered unfavorable for roots.

Rooting depth in land judging is placed in four classes:

Deep	36 inches or more
Moderately deep	20 to 36 inches
Shallow	10 to 20 inches
Very shallow	Less than 10 inches

Effect of Drainage on Rooting Depth

Natural drainage may sometimes affect rooting depth, especially in soils which are subject to flooding. Roots will not grow into a saturated soil layer, but will grow into the layer when the water is drained, either naturally or by means of an artificial drainage system. On most wetter soils, the lower layers are saturated early in the growing season and in winter, but are not saturated in mid to late summer. At these times, roots may extend as deep as 36 inches or more into the soil unless there are restrictive layers present. Occasionally, heavy rains or flooding may saturate the subsoil and kill roots growing there. This will lower yields of crops. However, because in most years roots are not limited by wetness in the summer, poor drainage will not be considered to limit rooting depth.

Importance of Rooting Depth

Rooting depth is important because it affects the total amount of soil from which roots can take water and nutrients. Soils with deeper rooting depth can provide more water to plants. Crops growing on deeper soils resist drought better. Deeper rooting depths result in soils of higher productivity.

Rock Fragments

What Are Rock Fragments?

Rock fragments are loose pieces of rocks of any kind or shape larger than sand. They include flat pieces or chips of shale and slate; fragments of chert, limestone or sandstone; and waterworn pebbles and cobbles. They include all kinds of rocks except fixed outcrops of bedrock.

Significance of Rock Fragments

Rock fragments influence water storage, infiltration and runoff. A soil that is 50 percent by volume rock fragments would have roughly one-half the available water-holding capacity of a similar soil that is free of rocks. Rock fragments interfere with tillage but ordinarily do not prevent it.

How is Rock Fragment Content Determined?

Rock fragments are measured as the percentage of the total soil volume that is taken up by rock fragments. A fairly quick and reliable estimate can be made by taking a quantity of the soil and separating it into two stacks - the fragments and the fines. If, for example, the stack of fragments is one-fourth as large as the stack of fines, then the soil has 20 percent by volume of rock fragments. Three classes of rock fragments are defined.

None or Few - Less than 15 percent by volume of rock fragments.

Common - 15 to 35 percent by volume of rock fragments.

Many - Over 35 percent by volume of rock fragments.

Rock fragment content is averaged over the entire rooting depth.

Rock Outcrops

What Are Rock Outcrops?

Rock outcrops are hard, fixed exposures of bedrock. Limestone is the most common kind in Tennessee, but they may be any kind of rock. Rock outcrops are not movable with ordinary machinery.

How Are Rock Outcrops Determined?

Rock outcrops are measured by distances between them and the amount of the surface area that they occupy. Three classes are defined:

None or Few - No rock outcrop, or they occupy less than 0.1 percent of the surface and average more than 200 feet apart. This is roughly one outcrop per acre or less, and occupying less than 50 square feet per acre. Outcrops are too few to greatly interfere with tillage.

Common - Rock outcrops average 100 to 200 feet apart and cover 0.1 to 2 percent of the surface. This is roughly 1 to 5 rock outcrops per acre, occupying 50 to 900 square feet per acre. Outcrops interfere with tillage but do not make it impractical.

Many - Rock outcrops average less than 100 feet apart or cover more than 2 percent of the surface. This is roughly more than 5 rock outcrops per acre occupying more than 900 square feet per acre. Outcrops are numerous enough to generally make tillage impractical.

Drainage

How Soil Drainage Is Determined

Drainage refers to the rapidity and extent of the removal of water from the soil.

Soil drainage can be determined from soil color. Red, brown or yellow colors generally indicate that drainage is favorable and that the soil is not saturated frequently. Gray and black colors or gray mottling indicate that periods of soil saturation are frequent and fairly long. The lack of good soil drainage is most commonly due to a high water table, a slowly permeable layer within the profile, seepage or some combination of these conditions. Five classes of drainage are defined:

Poorly-Drained: Water is removed so slowly that the soil remains wet for a large part of the time. The soil is saturated within about 1 foot or less of the surface during some season of the year. The length of saturation period is long enough (probably about three months+) for dominantly gray colors to form. Poorly-drained soils are dominantly (more than 50 percent) gray in the 10-inch layer just below the plow layer. They may be free of mottles or they may have brownish, reddish or yellowish mottles. If the soil has no distinct plow layer, colors should be checked between 7 and 17 inches.

Somewhat Poorly-Drained: Water is removed so slowly that the soil is wet for significant periods but not all the time. The soil is saturated to within 1 foot or less of the surface during some season of the year. The length of saturation is long enough (probably one to two months) for some gray colors to form. Colors of the 10-inch layer just below the bottom of the plow layer are as follows: dominantly (more than 50 percent) brownish, yellowish or reddish; and few to many (up to 50 percent) grayish mottles. Colors should be determined between a depth of 7 and 17 inches if there is no distinct plow layer.

Moderately Well-Drained: Water is removed from the soil somewhat slowly so that the soil is wet for small but significant parts of the time. The soil is saturated in the lower part of the subsoil for about one to two months each year, which is long enough for some gray colors to form. Moderately well-drained soils have reddish, brownish or yellowish colors without gray mottles in the 10-inch layer just below the plow layer. The soil has either gray mottles or is dominantly gray within a depth of 36 inches. If there is no distinct plow layer, assume it is 7 inches thick.

Well-Drained: Water is removed from the soil readily but not rapidly. Well-drained soils are not waterlogged long enough within 3 feet of the surface for gray mottles to form. Well-drained soils are reddish, brownish or yellowish to a depth of 3 feet or more without gray mottles.

Excessively Drained: Water is removed from the soil very rapidly. Excessively drained soils have no gray mottles within 36 inches, and have subsoils that have loamy texture with many coarse fragments, or subsoils that have coarse texture, from the bottom of the plow layer (or 7 inches) to 36 inches or to bedrock.

Why is Soil Drainage Important?

Poor drainage causes soils to warm up slowly. It delays land preparation, cultivation or harvesting and causes roots to suffocate.

Soil drainage influences land use, cropping management, kind of crops, planting and harvesting dates and yields. Wetter soil may be improved by artificial drainage in some cases.

Available Water-Holding Capacity

What is Available Water-Holding Capacity?

Available water-holding capacity (AWHC) is the amount of water a soil can store and release for use by plants. Sandy soils hold very little water and have a low AWHC. Thus they are droughty. Clay absorbs and holds a large amount of water, but a large proportion of the water is so tightly held that it is unavailable to plants. Thus clayey soils have an intermediate AWHC. Silt particles absorb a moderately high amount of water, and most of it is available for plant use. Therefore, medium-textured soils high in silt have the highest AWHC and are the least subject to drought.

How AWHC Is Determined

In land judging, AWHC is estimated using texture, rooting depth and coarse fragment content.

Available water-holding capacity varies by soil texture. The average AWHC of soils of different textures is as follows:

Texture of Soil	Average AWHC inches/inch
Coarse	.05
Medium	.20
Fine	.15

To estimate available water capacity of a soil, follow these steps:

1. Determine the rooting depth. If 36 inches or more, consider the rooting depth to be 36 inches.
2. Within the rooting depth determine the thickness, in inches, of each layer of the soil having different textures (coarse, medium and fine).
3. Determine the AWHC for each layer by multiplying the thickness of the layer (in inches) by the available water capacity (in inches/inch) for the texture of the layer.
4. If any of the layers contain rock fragments (15 percent or more) reduce the AWHC for that layer by a percentage equal to the percentage of rock frag-

ments because the volume occupied by coarse fragments will not hold water. (Less than 15 percent fragments, make no deduction).

5. Then add the available water-holding capacities for each layer in the root zone.

Examples:

Soil A: Moderately well-drained, medium-textured soil with less than 15 percent rock fragments and with a fragipan at 26 inches: 26 inches x .20 inches/inch = 5.20 inches available water capacity.

Soil B: Rooting zone is deep (36 inches+). Use 36 inches. The top 10 inches is medium-textured; the lower 26 inches is fine-textured; rock fragments less than 15 percent.
10 inches x .20 = 2.00
26 inches x .15 = 3.90
Total = 5.90 inches available water capacity

Soil C: Rooting zone depth is deep (36 inches+). Use 36 inches. Top 15 inches has 20 percent rock fragments and is medium-textured. The lower 21 inches has 30 percent rock fragments and is fine-textured.
Top - 15 inches x .20 inches/inch = 3.0
Less 20 percent for rock fragments
20 percent of 3.0 = .60
3.0 - .60 = 2.40 inches of water in top 15 inches.
Lower 21 inches x .15 inches/inch = 3.15
Less 30 percent for rock fragments
30 percent of 3.15 = .95
3.15 - .95 = 2.20 inches water in lower 21 inches
2.40 + 2.20 = 4.6 inches total available water capacity

For soil judging in Tennessee the following guide will be used in evaluating available water capacity of the root zone:

Available Water Holding Capacity	Available Water Holding Capacity in Inches
Low	Less than 4.0
Medium	4.0 to less than 6.0
High	6.0 or more

Slope

What Is Slope?

Soil slope is the change in vertical elevation over a given horizontal distance. It is expressed as a percent, which is equal to the change in elevation, divided by the horizontal distance, times 100 percent. For example, if elevation changes by 8 feet over a distance of 50 feet, then: 8 ft. / 50 ft. X 100% = 16 percent slope.

How Is Slope Determined?

Slope is determined in land judging by estimating the change in elevation. Slope estimation is a skill which can only be developed by practice. Judges in contests are encouraged to indicate the specific area on which slope will be determined by setting up slope stakes at a known horizontal distance. If slope stakes are not provided, then contestants should estimate the slope of the designated field.

Slope classes of soils have been defined as a means of mapping soils and making recommendations about their use. Slope class ranges vary between regions depending on soil and climate characteristics. Slope classes are often referred to by letters, with "A" slopes being nearly level, "B" slopes gently sloping, and so forth up to "F" slopes which are very steep.

Slope classes used in Tennessee are:

Middle and East Tennessee	
Slope class	**Slope Range**
Nearly level (A)	0 to 2%
Gently sloping (B)	2 to 5%
Sloping (C)	5 to 12%
Moderately steep (D)	12 to 20%
Steep (E)	20 to 30%
Very steep (F)	30% or more

West Tennessee	
Slope class	**Slope Range**
Nearly level (A)	0 to 2%
Gently sloping (B)	2 to 5%
Sloping (C)	5 to 8%
Moderately steep (D)	8 to 12%
Steep (E)	12 to 20%
Very steep (F)	20% or more

Why Is Slope Important?

With the same soil and management, soil erosion becomes greater as the slope of the land increases. Steeper slopes have more runoff and are more droughty. Steeper slopes also limit machinery operation and homesite suitability.

Slope must be considered when deciding the land use, the crop to be grown and the conservation measures to be used.

Degree of Soil Erosion

What Is Soil Erosion?

Soil erosion is the removal of soil material from the soil surface by flowing water or wind. Erosion is a natural process. Most of the relief we see on the landscape is a result of slow removal of soil and rock by erosion. Soil erosion becomes a concern when human activities increase it well beyond its natural rate.

Erosion by water results when soil on slopes is left unprotected by vegetation, either living or dead. The soil is exposed to raindrop impact. The energy of these impacts detaches soil particles, which are carried downslope by runoff of the rainwater.

In most cases, eroded soil is removed in thin sheets or from small rills. However, if enough runoff concentrates in channels, gully erosion occurs. Gullies are ditches or channels that may be a few inches to several feet deep. Gully erosion removes large quantities of soil very rapidly.

How Is Degree Of Soil Erosion Determined?

The best way to determine degree of erosion is by comparing a soil to an uneroded soil under natural vegetation. Since this is not possible in land judging, degree of erosion is determined by estimating the amount of subsoil material mixed into the plow layer. This method can be used in Tennessee because on most soils subject to erosion, the subsoil is usually higher in clay than the original surface, the original surface soil is usually darker in color than the subsoil, and the original surface layer was usually close to the normal depth of plowing in thickness. Thus as soil erosion removed the surface of the soil, continued plowing mixed in more clayey, lighter-colored material from the subsoil.

When possible, judges should provide samples of original surface and original subsoil material for the contestants to examine.

Estimates of mixing should be based on the plow layer, or on the upper 7 inches of soil if no distinct plow layer is present.

In land judging, three classes of degree of erosion are recognized:

None to slight - The plow layer consists largely of original surface soil. Less than 25 percent of the plow layer is made up of original subsoil material.

Moderate - The plow layer consists of a mixture of original subsoil and surface soil material. From 25 to 75 percent of the plow layer is made up of original subsoil material.

Severe - The plow layer consists largely of subsoil material. More than 75 percent of the plow layer is made up of original subsoil material.

Importance of Degree of Erosion

Generally the original surface layer of a soil has higher fertility, better structure, higher water-holding capacity and less clay than the subsoil. Thus more eroded soils which have lost original surface soil tend to have lower soil productivity. The amount of productivity loss depends on the degree of difference between surface soil and subsoil.

Erosion is especially damaging on soils with root-restricting layers in the subsoil. On these soils erosion reduces rooting depth. This decreases available water-holding capacity, increasing the likelihood of drought damage.

When soils have been severely eroded, they are often even more susceptible than uneroded soils to further damage. As a result, severely eroded soils on slopes suitable for crop production are placed in a more limited land class (See Capability Classification).

Surface Runoff

Surface runoff refers to the relative rate water is moved by flow over the surface of the soil. Surface runoff is not judged in land judging, but an understanding of the concept is important for understanding other properties.

Surface runoff is influenced by characteristics of the soil, slope, climate and cover. It affects land use, cropping systems, kind of plants and water management practices. Surface runoff classes are defined as follows:

Ponded and very slow: Free water lies on the surface for long periods or enters immediately into the soil. Soils with very slow surface runoff are commonly level, in depressed areas, or very open and porous.

Slow: Free water covers the soil for significant periods or enters the soil rapidly. Soils with slow surface runoff are commonly nearly level or absorb water very rapidly. Normally there is little or no erosion hazard.

Medium: Surface water flows away at such a rate that a moderate proportion of the water enters the soil and free water lies on the surface for only short periods. The loss of water over the surface does not seriously reduce the supply available for plant growth. The erosion hazard is commonly moderate.

Rapid and very rapid: A large proportion of the precipitation moves rapidly over the surface of the soil and a small part moves through the soil. Surface water moves off nearly as fast as it is added. Soils with rapid or very rapid runoff are usually steep and/or have low infiltration capacities.

Structure

What Is Meant by Structure?

Soil structure is the arrangement of individual sand, silt and clay particles into clusters or compound particles which are separated from adjoining clusters by surfaces of weakness. These soil clusters or aggregates vary in:

- shape and arrangement
- size
- distinctness or durability.

Structure is not judged in land judging in Tennessee, but understanding soil structure is important in determining percolation rates and rooting depth.

How Is Soil Structure Determined?

Soil structure is determined in the field by slightly crushing or pulling apart a chunk of moist soil and noting the shape, size and durability of the individual aggregates.

The common types of soil structure in Tennessee are:

Granular: Aggregates are small particles and weakly held together. May be roughly spherical with many irregular surfaces; many surface soils in Tennessee have weak fine granular structure.

Blocky: Usually angular or subangular in shape varying in size from 1/16 inch to 1 inch in diameter. Most subsoils in Tennessee have angular or subangular blocky structure. This structure may be strong (easily seen - all particles aggregated) or weak.

There are other types of soil structure such as crumb, platy, prismatic, columnar, massive or single grain.

Why Is Structure Important?

Desirable structure may greatly improve tilth and ease with which water and air can move through the soil. Probably crumb and granular are the most desirable types of structures because they have the greatest proportion of large openings between the soil aggregates; subangular blocky structure is also desirable.

Permeability

What Is Soil Permeability?

Permeability is the amount of water in inches per hour that is able to move through the soil. Permeability is not judged in land judging in Tennessee, but understanding it is important in judging percolation rates.

How Is Soil Permeability Determined?

Soil permeability can be expressed in precise terms: movement of water through a soil layer in inches per hour under specified conditions. However, more commonly soils are placed in general permeability classes. Permeability classes are estimated through studies of structure, texture, porosity, cracking, organic matter and compaction. The permeability of a soil profile is set by that of the least permeable horizon in the subsoil (to a depth of about 36 inches). Relative classes of soil permeability are as follows:

Slow (also very slow): Commonly associated with fine-textured soils with massive or weak structure, soils with high shrink-swell or soils with fragipans.

Moderate: Soils with moderate number of pores and well defined blocky structure.

Many medium-textured soils in Tennessee have moderate permeability. Moderate permeability in all horizons of the soil is desirable, because this condition permits plant roots, water and air to move easily in the soil, allows excess water to drain away and yet holds sufficient water between rains or irrigations for good plant growth.

Rapid (also very rapid): Coarse-textured soils or loamy soils with many rock fragments.

Why Is Permeability Important?

Permeability is important in designing irrigation, drainage or waste disposal systems. Permeability also influences soil erosion, soil aeration and growth of plant roots and micro-organisms.

Many of the soils of Tennessee have moderate permeability. Well-defined fragipan horizons and some massive clay horizons will have slow or very slow permeability.

Percolation Rate

What Is Meant By Percolation Rate?

Percolation rate is the rate at which the soil will transmit a liquid. It is roughly the same as permeability except for units. Percolation rate is expressed in minutes per inch, while permeability is expressed in inches per hour. Percolation rate is one factor used for determining soil suitability for septic tank disposal fields.

How Is Percolation Rate Determined?

Percolation rate can be measured quantitatively but this cannot be done in land judging.

In the absence of precise measurements, soils may be placed in percolation rate classes through studies of structure, texture, porosity, cracking and presence of impervious layers such as fragipans or rock. The percolation rate is set by the least permeable layer in the upper 36 inches.

The material presented below is a set of general guides for judging percolation rate and not fixed criteria by which percolation rate for every soil in the state can be reliably estimated. Three percolation rate classes are defined:

- faster than 60 minutes per inch
- 60 to 75 minutes per inch
- slower than 75 minutes per inch

Faster Than 60 Minutes Per Inch

- Soils that have medium and coarse-textured subsoils and that do not have beginning within 3 feet, a fragipan or other impervious layer such as rock, or
- Soils that have fine-textured reddish (such as red, dark red, yellowish red, reddish brown) subsoils that have moderate or strong structure to a depth of 36 or more inches and that have low or moderate shrink-swell.

60 to 75 Minutes Per Inch

- Soils that have medium or coarse-textured subsoils with a discontinuous fragipan less than about 7 inches thick beginning within 3 feet from the surface, or
- Soils that have reddish fine-textured subsoils with moderate or strong structure to a depth of at least 24 inches but have a layer of yellowish or mottled plastic clay with weak or no structure between depths of 24 and 36 inches, or
- Soils that have yellowish-brown or yellow fine-textured subsoils with moderate or strong structure to a depth of 36 inches.

Slower Than 75 Minutes Per Inch

- Soils having a continuous fragipan more than 7 inches thick or impervious bedrock beginning within 3 feet, or
- Soils having high shrink-swell, or
- Soils having yellowish, grayish or black-

ish fine-textured subsoils with weak or no structure. These most commonly have a mottled color pattern.

If the fragipan begins between 29 and 36 inches below the surface, the entire thickness is considered, not just the part above 36 inches.

Shrink-Swell

What Is Meant By Shrink-Swell?

Shrink-swell is the amount that a soil will expand when wetted or contract when dried. It depends on the kinds and amounts of clay in the soil. It is a measure of volume change upon wetting or drying. Shrink-swell is important to soil use because, if it is high, it can crack pavements, foundations and walls and reduce permeability to near zero.

How To Judge Shrink-Swell

Most of the soils in Tennessee have low or moderate shrink-swell. There are only a few soils that have enough expandable clay to have a high shrink-swell. These are chiefly the dark mottled clays on the Mississippi Delta, the yellowish or mottled very plastic clays in the Coastal Plain, the yellowish or mottled very plastic weakly-structured clays less than about 3 feet to limestone in central and eastern Tennessee and some dark, very clayey soils on flood plains in central Tennessee. Soils that have high shrink-swell form surface cracks more than one-half inch wide when dry and have slickensides in the subsoil. Slickensides are polished and ground surfaces that are produced by one mass sliding past another. Examples of soil series in Tennessee that have high shrink-swell are Alligator, Colbert, Roellen, Agee and Sharkey. Talbott and Mimosa soils are moderate. The reddish clayey soils, such as Baxter, Fullerton, Dewey, Decatur and Tellico have moderate or low shrink-swell.

Three classes of shrink-swell commonly are recognized. These are high, moderate and low. In homesite selection, only the high shrink-swell class concerns us because, if less than high, it does not ordinarily present a limitation requiring special design in construction and additional expense. Thus, for soil judging purposes, only two classes are recognized: **high** and **moderate or low**. For high shrink-swell, check poor on the scorecard. For moderate or low, check good. Shrink-swell for the soil will be high if it is high for any layer within a depth of 36 inches.

Landscape Position

Landscape position refers to the location of a site relative to the landscape around it. Position is important because it affects flooding hazard and the water supply for plants. Generally, landscapes are divided into five positions, but for land judging two of these are combined to make four positions. These are:

Flood Plain

Flood plains are the nearly level areas adjacent to streams and upland drainageways that are subject to flooding. They are often referred to as bottoms or first bottoms. Flood plains are subject to flooding unless protected by dams or levees, though the frequency and duration of flooding varies considerably between flood plains. Flood plains occupy the lowest areas of the landscape. Soils in flood plains usually show relatively little profile development, meaning there is little difference in texture between the surface soil and subsoil. In land judging, all flood plains will be considered to be occasionally flooded.

Footslope

A footslope is the area at the base of a slope where material that has washed or slid downslope accumulates. Footslopes are in concave positions on the landscape, meaning that the slopes above them on the landscape are steeper than the slopes below them. Footslopes generally have slight to moderate profile development. Often they look like flood plain soils, but they are usually on more sloping areas and don't usually flood. Footslope areas receive runoff from higher areas on the landscape, giving them a higher water supplying capacity for plants.

Depression

A depression is a low area surrounded on all sides by higher-lying land. It has no natural outlet for surface water flow (open holes in the bottom of sinkholes are not considered outlets for surface flow). Most depressions are subject to flooding during heavy rains, though the frequency and duration may vary considerably. In land judging, all depressions will be considered to be occasionally flooded. Soils in depressions usually have slight to moderate profile development.

Upland and Terrace

These two positions include all areas of the landscape other than flood plains, depressions or footslopes. They are found on sideslopes, ridgetops and broad, level to gently sloping areas that are higher in elevation than the flood plain. Soils on terraces and uplands usually have moderate to strong profile development. Terraces are actually old flood plains that have been left above the elevation of the present day flood plain by stream entrenchment. Soils on terraces have formed in old alluvium (stream deposited material). Upland soils have formed in material derived from underlying rock, marine sediments, loess or other material not deposited by streams. Loess is silty material deposited by wind.

Uplands and terraces are actually separate positions, but in many cases they are difficult to differentiate in the field. Because similar soils may often occur on both, and because the use and management of land on both positions is similar, they are not separated in land judging.

Although some lower lying terraces do occasionally flood, in land judging both uplands and terraces will be considered not subject to flooding.

Land Capability Classification

What Is The Land Capability Classification?

The capability grouping is a system of classification to show the relative suitability of soils for crops, pasture or forestry. It is a practical grouping based on the needs and limitations of soils, the risks of damage to them and their response to management. There are two levels of the classification, the capability subclass and the capability class.

The capability subclass is used to indicate the dominant kind of limitation. Letter symbols identify the nature of the limitation. An "e" means that the main limiting factor is risk of erosion, if the plant cover is not maintained. A "w" means that excess water retards plant growth, interferes with cultivation or affects yields. An "s" means that the soils are shallow, stony, sandy, droughty or low in fertility.

The broadest grouping, the class, is

identified with Roman numerals. All of the soils in one class have limitations or hazards of about the same degree. There are eight classes (I through VIII) recognized in this system. In land judging, only the land class is determined, not the subclass.

Class I, II, III and IV soils are suitable for cropland. Class I soils have only slight limitations in use. Class II, III and IV soils have increasingly severe limitations for use as cropland as the land class increases. These limitations may be due to erosion hazard, drainage problems, soil depth, rock outcrop, stoniness or low water-holding capacity.

Class V soils have no erosion hazard, but are unsuitable for cropland due to other limitations. In Tennessee, these limitations are poor drainage combined with frequent flooding or ponding. Class V soils are usually suitable for forestry or grazing.

Class VI and VII soils are not suitable for cropland because of very severe limitations due to erosion hazard or other soil factors. Class VI soils are usually well suited for grazing, and both classes are suited for forestry.

Class VIII land has such severe restrictions that it has no value for either agriculture or forestry. This class is not currently recognized in Tennessee.

Determining Land Capability Class

Land capability classes are assigned based on slope, degree of erosion, internal drainage, depth, flooding hazard and other soil factors that limit plant growth or management choices. There are many possible combinations of these factors, and it is impossible to list them all. However, the following rules will cover most soil and landscape situations in Tennessee.

For most deep, well-drained soils on which erosion hazard is the major limitation to use, land class depends on slope class and degree of erosion.

Table 1. Effect of Slope and Degree of Erosion On Land Class

Degree of Erosion	**Slope Class**					
	A	**B**	**C**	**D**	**E**	**F**
Slight or Moderate	I	II	III	IV	VI	VII
Severe	II	III	IV	VI	VI	VII

Drainage also affects land class. In nonflooded positions, on A slopes, well-drained soils are Class I, moderately well-drained soils are Class II, somewhat poorly-drained soils are Class III and poorly drained soils are Class IV. If subject to occasional flooding, well-drained soils are Class II, while other drainage classes are unchanged. If subject to frequent flooding, land class increases by one class from that for occasional flooding.

Rare means floods occur in less than one out of 20 years. Occasional means flooding occurs between one and 10 out of 20 years. Frequent flooding means floods occur in more than 10 out of 20 years.

Generally, flooding frequency tends to be higher on wetter soils, because they are usually on the lowest parts of the flood plain. Since it is impossible to judge the flooding frequency without knowing the history of the site, in land judging it will be assumed that all flood plains and depressions flood occasionally, while footslopes, uplands and terraces do not flood.

Depth to rock or structureless clay also affects land class. For soils which are moderately deep to bedrock, or less than 24 inches deep to massive structureless clay, land class should be increased by one class from that given in Table 1, except that Class IV should be increased by two classes to Class VI and Class VII remains as Class VII. For soils which are shallow to bedrock, land class should be increased by two classes from that given in Table 1, except Class III increases to Class VI and Class IV increases to Class VII. For soils which are very shallow to bedrock, A, B and C slopes are Class VI, and steeper slopes are Class VII.

Rock outcrops increase land class. If rock outcrops are common, A and B slopes are Class III, while all other slopes are the same as in Table 1. If there are many rock outcrops, A, B and C slopes are Class VI and steeper slopes are Class VII.

For soils that have coarse texture in both surface and subsoil or have many rock fragments, land class will be increased by one class from that shown in Table 1, except that Class IV will be increased to Class VI and no land can be above Class VII.

Land class at a particular location is determined by the most limiting factor. For example, a moderately eroded soil on a B slope would be Class II by Table 1. However, if it is also somewhat poorly drained it is Class III. The drainage problem is the more limiting in this case, so the land should be placed in Class III. In the same manner, well-drained land on a B slope with common rock outcrops can be no better than Class III. If it also is shallow to bedrock, then it is Class IV.

Because the Soil Conservation Service takes many factors into account in determining land class, the land class assigned by SCS may occasionally differ slightly from the class determined by these rules. For land judging, these rules should be used as the guide.

Limitations for Crop Production

Limitations for crop production are soil and landscape factors that reduce crop yields, limit the kinds of crops that can be grown or require special management practices to overcome. The best soils for crop production in Tennessee will have none of the limitations listed below. Unfortunately, however, most soils in Tennessee will have one or more of these limitations.

The eight soil and landscape factors listed below are the most common limitations in Tennessee:

1. **Wetness:** Wetness affects the kinds of crops which can be grown, crop yields and timing and ease of farming operation. Moderately well-drained, somewhat poorly-drained and poorly-drained soils have limitations due to wetness.
2. **Slope:** Slope affects erosion hazard, runoff, crop yields and machinery operation. Slope is a limitation if it is 2 percent or more.
3. **Texture of surface soil:** Soils with fine-textured surface layers are difficult to till and subject to high rates of runoff. Soils with coarse-textured surfaces tend to be droughty and allow nutrients to leach easily. Therefore, texture of the surface soil is a limitation if the texture is either fine or coarse.
4. **Texture of subsoil:** Subsoil layers which are very clayey and very plastic and which have little or no structure limit root growth and water movement. However, fine-textured subsoils with good soil structure are not a limitation. The poorly-structured, very plastic, fine-textured subsoils are usually yellow, reddish yellow with brown, yellow or gray mottles or gray. When moist, the layer will appear massive, with little visible structure. Those fine- textured subsoils which are not a limitation may be any color, depending on drainage and parent material, but they tend to be more red or reddish yellow, and will have visible blocky structure when moist.

   Soils with coarse subsoils tend to be droughty, and allow rapid movement of water. This rapid movement of water can result in pollution of groundwater by leaching of nutrients or chemicals. Soils with coarse subsoils will have a limitation due to subsoil texture.
5. **Available water-holding capacity:** This is one of the most important properties of a

soil for crop production. Even in humid regions like Tennessee, drought is the most common factor limiting crop yields. Therefore, the ability of a soil to store water and make it available to plants is a critical factor in determining its value for crop production. Available water-holding capacity will be considered a limitation if it is less than 6 inches in the rooting zone.

6. **Rock fragments or rock outcrop:** Fragments and rock outcrops affect water supply to plants and feasibility of tillage. They are a limitation if there are either common or many fragments or rock outcrops.
7. **Effective depth:** Effective depth affects soil productivity through its effect on available water-holding capacity. Effective depth is a limitation when it is less than 30 inches.
8. **Flooding:** Flooding can greatly restrict the use of land for crop production, depending on the timing and length of the floods. Floods which are rare, recede quickly and occur mainly in winter are much less limiting than frequent floods during the growing season for warm season crops. Since flooding frequency is impossible to judge without a lot of information, all flood plains and depressions will be considered to flood occasionally, and to have a limitation due to flooding. All other landscape positions do not have a flooding limitation.

Estimating Crop Yields

Crop yields in any one year depend on many factors, including soils, weather, input levels and management. But with a high level of management, long term average yields are largely controlled by soil properties.

The most important soil properties affecting crop yields are available water-holding capacity (AWHC), slope, soil wetness and flooding hazard. The effects of these properties on yield depend on the characteristics of the crop.

In land judging, general yield levels are estimated for seven crops. Yields are placed in one of three yield classes: high, medium or low or not adapted. Yield estimates are based on a high level of management, land use within its capabilities, and use of recommended soil management and conservation practices. Yields for a crop will be in the low or unadapted range if the land capability class is not suitable for production of that crop.

Corn is a warm season annual which is very sensitive to drought stress and needs to be planted fairly early. Corn yields are high on soils with high AWHC on A and B slopes, except for poorly drained soils. Corn yields on these wetter soils are medium, because early season wetness delays planting. Corn yields are low on all soils with low AWHC, and on soils with medium AWHC on D slopes. Corn yields are medium on all other soils which are suited for annual crops.

Cotton is a warm season crop which needs to be planted moderately early and is somewhat drought resistant. Cotton is sensitive to cool, wet soils early in the season. Cotton yields are high on the same soils as corn. Cotton yields are low on all soils with low AWHC and on poorly drained soils in floodplains and depressions. Cotton yields are medium on all other adapted soils.

Soybean is a warm season annual, which is tolerant of wetness, somewhat drought tolerant and can be planted moderately late. Soybean yields are high on all soils with high AWHC on A, B or C slopes. Soybean yields are low on all soils with low AWHC. Yields are medium on all other adapted soils.

Tobacco is a warm season crop which is very sensitive to wetness and flooding. Tobacco yields are high on well-drained soils with high AWHC on A and B slopes which do not flood. Tobacco yields are low on soils with low AWHC, soils with medium AWHC on D slopes and all poorly and somewhat poorly-drained soils. Yields are medium on all other adapted soils.

Small grains are winter annuals such as wheat, barley and oats. Because they grow in the winter, they are less subject to drought than other crops. They are somewhat sensitive to wetness and flooding. Small grain yields are high on nonflooded, well-drained and moderately well-drained soils with high AWHC on A, B and C slopes, or with medium AWHC on A and B slopes. Small grain yields are low on soils with low AWHC on slopes greater than 5 percent, on soils with very shallow rooting depth, and on poorly and somewhat poorly-drained soils which are subject to flooding. Yields are medium on all other adapted soils.

Alfalfa is a warm season perennial legume grown for forage. It is somewhat drought tolerant, but very sensitive to wetness. Alfalfa yields are high on well-drained, nonflooded soils with high AWHC on A, B and C slopes. Alfalfa yields are low on all poorly drained and somewhat poorly drained soils, on moderately well drained soils which flood, and on soils with low AWHC. Yields are medium on all other adapted soils.

Fescue and white clover are a common cool season perennial grass/legume mixture grown for pasture and hay. Because most growth takes place in the cool season, fescue and white clover tend to avoid drought. They are also tolerant of wetness. Yields are high on all soils with high AWHC and on soils with medium AWHC on A, B and C slopes. Yields are low on soils with low AWHC on D, E and F slopes, and on soils with very shallow rooting depth. Yields are medium on all other adapted soils.

Potential Environmental Problems

In addition to the need for controlling erosion to maintain productivity of the land, proper management systems should avoid offsite damage to the environment. The major environmental problem in agricultural production is water pollution. The potential for two types of water pollution problems will be determined in land judging. The potential will be rated as high, medium or low.

Sediment, nutrients and/or pesticides in streams - Sediment is probably the most common form of water pollution from agriculture in Tennessee. Nutrients and/or pesticides may be attached to the sediment, or may be dissolved in runoff. The potential for sediment movement into streams is closely related to the potential for soil erosion. The potential for nutrient and pesticide movement into streams is related to the potential for runoff and soil erosion. Problems can be avoided by use of good soil conservation systems and by proper use of fertilizer, manure and pesticides.

High Potential - Cropland with slopes greater than 5 percent.

Medium Potential - Cropland with slopes of 2 to 5 percent.

Low Potential - Cropland on 0 to 2 percent slopes and land not suitable for crop production.

Nitrates and/or pesticides in groundwater - This appears to be a very minor problem in Tennessee. However, the potential for a problem does exist in some situations if nitrogen fertilizers and pesticides are not properly used. These potential problem areas have soils which allow relatively easy movement of water through the soil profile.

High Potential - Soils with coarse texture in the subsoil beginning at less than 24 inches and extending to 36 inches or to bedrock or soils which are shallow or very shallow to bedrock.

Medium Potential - Soils with a medium subsoil texture (18 to 24 inches) but with coarse texture beginning between 24 and 36 inches and extending to 36 inches or to bedrock, soils with medium-textured subsoils that are moderately deep to bedrock, or soils with medium-textured subsoils that have many rock fragments.

Low Potential - All other soils, and any land for which trees are the most intense recommended use.

Intensity of Land Use

In selecting the most intensive recommended land use, the main consideration is the soil erosion hazard. Proper use intensity must maintain long term soil productivity by keeping soil erosion at acceptable levels. Other considerations include soil productivity, effects on water quality and safety or feasibility of machinery operations.

On land suitable for cropland (Classes I, II, III or IV) the recommended intensity of use depends on the slope class. Nearly level land (0 to 2 percent slope) can be used for continuous annual crops with minimal conservation systems. This is because the erosion hazard is low. As the slope increases, the erosion hazard also increases and more intensive conservation systems have to be used to maintain continuous cropping. Gently sloping land (2 to 5 percent slopes) can be used for continuous annual crops with intensive conservation systems. Intensive conservation systems include practices like no-till, conservation tillage, terraces, cover crops, contour farming and strip cropping. Some sloping land (5 to 8 percent slopes in West Tennessee, 5-12 percent slopes in Middle and East Tennessee) can be safely used for continuous annual crops with very intensive conservation systems, high residue crops and no-till. However, in most cases on sloping land, soil erosion rates cannot be kept at an acceptable level in continuous annual crop production, even with the most intensive conservation systems. Therefore, in land judging, on all cropland which is sloping or moderately steep (greater than 5 percent slopes, but still Class III or IV land) the most intensive recommended use will be annual crops in rotation with perennial grass and/or legume cover.

The most intensive recommended use for Class V and VI land is permanent grass and/or legume cover. Some Class VII land can be used for pasture, but most is too steep, erosive or rocky for any use more intense than forest. Therefore in land judging, the most intensive recommended use on Class VII land is trees.

Wildlife and recreation are important land uses in Tennessee. However, since all land classes from I through VII can be used for these purposes, they are not included in land judging.

Conservation and Soil Management Practices

Good conservation and soil management systems include a number of practices. Practices used depend on the limitations of the soil and the landscape characteristics of the site. Some of the more important practices used in Tennessee are listed below, with definitions and recommended conditions for their use. Note: the term cropland refers to land in Class I, II, III or IV.

Drainage System - Removal of excess water from the soil surface or subsoil by means of ditches or drainage tubes (tile lines). This practice requires an outlet and land with relatively little slope. This practice is not appropriate in a depression due to lack of an outlet. Outlets are assumed to be available on other landscape positions. Drainage is appropriate, where outlets exist, on somewhat poorly-drained and poorly-drained soils on slopes of 2 percent or less.

Conservation tillage/No-till - Conservation tillage systems are those which leave at least 30 percent of the soil surface protected by residue after planting. Conservation tillage is highly effective in controlling erosion. No-till, which disturbs only enough soil to allow seed placement, is the most effective form of conservation tillage. Conservation tillage or no-till cannot actually be used in every crop in every situation because of various management problems. But, because it is economical and highly effective, it is recommended on all cropland with slopes of 2 percent or more.

Terraces - Terraces are ridges and channels constructed across slopes, nearly following contour lines. They catch runoff water and carry it out of the field in a non-erosive manner. Terraces empty into an outlet, either a pipe or a waterway. Terraces can be very effective, but they are very expensive to build and maintain. The need for terraces is affected by the tillage system used. If conservation tillage is used, terraces may not be needed. However, because conservation tillage cannot be used in all situations, terraces are recommended on cropland with slopes of 2 to 8 percent.

Grassed waterways - A sodded channel, either natural or constructed, designed to prevent gullying and to collect runoff water from contour rows or terraces. Waterways carry the runoff off the field. Waterways are recommended on all cropland with slopes greater than 2 percent.

Contour farming - Contour farming means conducting farming operations and running rows of crops across the slope, rather than up and down the slope. Rows and farming operations should parallel the contour of the land as much as possible. Contour farming is recommended on all cropland with slopes greater than 2 percent.

Strip cropping - Strip cropping means growing crops in a pattern of alternating strips across the slope. Strips of row crops are grown between strips of close-growing crops. Like terraces, the need for strip cropping depends on the tillage system used. Strip cropping may not be necessary on some land when conservation tillage is used. However, since conservation tillage cannot be used for all crops, strip cropping is recommended on all cropland with slopes greater than 2 percent.

Filter strips - Filter strips are strips of grass or other perennial vegetation. They are placed along the border of cropped fields in areas where runoff leaves the field. Filter strips filter out sediment, nutrients and chemicals from runoff before it leaves the field and enters streams. This protects water quality. Filter strips are recommended for all cropland.

Cover crops - Cover crops are crops planted in the fall to provide vegetative cover during the winter. They protect the soil from erosion during this period. They are either small grains or winter annual legumes like vetch and crimson clover. Cover crops are most often needed following low residue crops like soybeans, cotton and corn silage. They are recommended for all cropland with slopes of more than 2 percent.

Lime and fertilize by soil test - Almost all soils in Tennessee must have certain nutrients added if they are to remain productive over time. To guess about nutrient needs can be expensive and potentially harmful to the environment. Therefore, all agricultural land should have soil tests conducted on a regular schedule, and should be limed and fertilized based on soil test recommendations. Soil testing is a recommended practice on all land except Class VII.

Homesite Suitability

Soils that are most desirable for this use have good drainage, favorable percolation rates, freedom from flooding and moderate slope. Further, the soil should have adequate depth to rock for functioning of septic tank drain fields, and it should not have high shrink-swell that might cause cracking of foundations and walls. Soils that have unfavorable properties can sometimes be used as sites for residential building, but the unfavorable properties must be overcome, often at considerable expense.

Guidelines for Judging Suitability

Soil factors are placed in three classes of suitability for dwelling sites requiring septic tank disposal fields. These are: good, fair and poor. General criteria for arriving at suitability ratings are given below:

Good:

Drainage: Well-drained or excessively drained.
Flooding: Never flooded.
Depth to Rock: More than 60 inches or (for soil judging purposes) to the bottom of the pit, whichever is shallower.
Slope: Less than 12 percent slope.
Percolation Rate: Faster than 60 minutes per inch.
Shrink-Swell: Low or moderate.

Fair:

Drainage: Moderately well-drained.
Depth to Rock: Bedrock between depths of 40 and 60 inches.
Slope: 12 to 20 percent slope.
Percolation Rate: 60 to 75 minutes per inch.

Poor:

Drainage: Somewhat poorly-drained or poorly-drained.
Flooding: Subject to flooding.
Depth to Rock: Less than 40 inches.
Slope: More than 20 percent slope.
Percolation Rate: More than 75 minutes per inch.
Shrink-Swell: High

Final Suitability Rating:

Good - All criteria good.
Fair - One or more criteria fair, none poor.
Poor - One or more criteria poor.

Organization & Procedure: Land Judging Contest

The Tennessee Land Judging Contest is open to bona fide FFA and 4-H Club members. Both groups may participate, but will not compete against each other.

The contest will be conducted on three levels: county, district and state.

County Contest:

The county agricultural agent of the Agricultural Extension Service will serve as temporary chairman and will call together a committee composed of delegated representatives of vocational agriculture, Tennessee Farmers Mutual Insurance Company, the chairman of the Soil Conservation District supervisors, the chairman of the county Agricultural Extension Committee, the conservationist of the Soil Conservation Service and a representative of the Soil Conservation Society of America in counties where the association has membership.

The county agricultural Extension agents or assistants and the vocational agriculture teachers will be responsible for training contestants.

The Tennessee Farmers Mutual

Insurance Company will provide through FFA and 4-H Clubs appropriate recognition pins.

The county committee will determine the date for the county contest, but it must be completed before the date of the district contest. Counties participating in this activity may send no more than one FFA team and two senior 4-H Club teams to the district contest. Vocational agriculture may elect to hold sub-district elimination contests and send only the sub-district winner to the district contest. In this event, the high scoring team from each county will be declared the county winner.

District Contest:

A district contest will be held in West, Middle and East Tennessee districts for vocational agriculture and in the five Extension districts for the Extension Service. This contest must be completed at least two weeks before the state contest.

The Tennessee Farmers Mutual Insurance Company will sponsor the contest. Cooperating agencies and groups will include the Agricultural Extension Service, vocational agriculture, Soil Conservation Service, Soil Conservation Society of America, Soil Conservation District supervisors, Agricultural Experiment Station, Farm Bureau, County Agricultural Extension Committees, Soil Scientists Association, Tennessee Department of Agriculture and others.

Arrangements for the district contest conducted within the vocational agriculture districts will be the responsibility of the district vocational agriculture supervisor. The associate district supervisors of the Agricultural Extension Service will be responsible for arrangements for the contest in their respective districts.

Monetary awards may be provided to the two top FFA and 4-H Club teams.

The winning teams in the district must go to the state contest or forfeit any award money. In case of forfeit, the award money would go to the next highest scoring team.

State Contest:

The state contest must be completed at least two weeks before the International Contest in Oklahoma. The sponsor for the state contest will be the Tennessee Farmers Mutual Insurance Company. Cooperating agencies and groups will be the same as those shown for the district contest.

Chairmanship of the state arrangements committee will rotate among representatives of the cooperating agencies. The state chairman cannot serve two consecutive terms. The arrangements committee for the state contest will be composed of a member from each of the cooperating agencies and/or groups and a representative of the sponsor. Each agency and/or organization committee member will be designated by the agency or organization head. Plaques will be awarded to the winner and runner up FFA teams and the winner and runner up 4-H Club teams. These four teams will be designated to represent Tennessee at the International Land Judging Contest in Oklahoma. Each of these teams will receive a monetary award to be used for expenses to the International Contest. These four winning teams must go to the International Contest or forfeit the award money. In case of forfeit, the award money will go to the next highest scoring team. (i.e., if a winning FFA team could not attend the International Contest, then the next highest scoring FFA team that could attend the contest would be given the award money.) However, the plaques awarded to the winners would remain with that team even though they did not go to the International Contest. Awards will be presented to the winners at a banquet following the state contest.

Rules for the Contest

1. The "Tennessee Land Judging Score Card" will serve as the official score card at all levels of the contest.

2. Teams will be composed of four members; however, teams with only three members will be eligible to compete.

3. The total team score will be determined by combining the scores of the three highest team members.

4. All FFA team members must be active members of FFA Chapters in Tennessee and currently enrolled in an all-day class in vocational agriculture.

5. The FFA team representing the county will be from a single chapter and only one team from each chapter will be eligible to compete in the contest.

6. A 4-H Club team member in the senior contest must be an active senior member of a 4-H Club and enrolled in project work.

7. Members of a 4-H Club team shall represent the same county and belong to a 4-H Club in that county.

8. Three or four contest sites will be used at all levels of the contest.

9. In case of ties between teams, the following procedure will be used to determine the winner:

   (1) Score of the alternate team member.

   (2) The team making the highest score on "Part I."

   (3) The team making the highest score on "Part II."

   (4) The team making the highest score on "Part III."

   (5) The team making the highest score on "Part IV."

   (6) In case of a further tie, the team making the highest score on "A, B and C, etc." of "Part II" and "A and B" of "Part III" respectively.
   Ties between individuals for high individual awards will be broken using the procedure outlined in (2) through (6) above, substituting "individual" for "team."

10. The decision of the judging will be final.

11. Members of the state winning land judging team will be ineligible to compete in succeeding years.

12. Members of a first or second place FFA team in a district contest may not compete in a subsequent district contest as a 4-H member in the same year. Likewise, members of a first or second place 4-H team in a district contest may not compete in a subsequent district contest as a FFA member in the same year.

13. Any team member or coach who visits or goes near the contest site prior to the contest will automatically disqualify his or her team from participating in the contest.

14. The above rules will apply at all levels of the contest.

The following system will be used by the judges at all levels of the contest in determining the contestant's scores:

Part I:

A. Texture of surface soil:
The score will be 5 if correct

B. Texture of subsoil:
The score will be 5 if correct

C. Depth of soil:
The score will be 6 if correct

D. Rock outcrop:
The score will be 2 if correct

E. Drainage class:
The score will be 6 if correct

F. Rock fragments:
The score will be 2 if correct

G. Available water capacity:
The score will be 6 if correct

H. Slope:
The score will be 6 if correct

I. Erosion:
The score will be 3 if correct

J. Position of site on the landscape:
The score will be 5 if correct

Part II

A. Land classes:
The score will be 4 if correct

B. Check limitations of this soil for crop production:
1 point for each correct answer. A correct answer includes those that are **not** checked as well as those that need to be checked.

C. Estimated productivity:
1 point for each correct answer

D. Potential environmental problems:
2 points for each correct answer.

Part III

A. Most intensive recommended use:
The score will be 6 if correct

B. Recommended practices:
1 point for each correct answer. A correct answer includes those that are **not** to be checked as well as those that need to be checked.

Part IV

A. Factors for placement in good, fair or poor:
2 points for each correct answer.

B. Suitability for homesites:
The score will be 4 if correct

TENNESSEE LAND JUDGING SCORE CARD

Name________________________Contestant's Number__________

Address____

FIELD NUMBER__________COUNTY OR CHAPTER________________

Score

Part I__________

Part II__________

Part IV__________

TOTAL__________

PART I PHYSICAL CHARACTERISTICS OF THE SOIL

Check Only One Answer for Each Soil Characteristic

A. Texture of Surface Soil (5 points)

- Coarse ☐
- Medium ☐
- Fine ☐

B. Texture of Subsoil (5 points)

- Coarse ☐
- Medium ☐
- Fine ☐

C. Depth of Soil Favorable for Roots (6 points)

- Deep — 36 inches or more ☐
- Moderately deep — 20 to 36 inches ☐
- Shallow — 10 to 20 inches ☐
- Very shallow — Less than 10 inches ☐

D. Rock Outcrops (2 points)

- None or Few ☐
- Common ☐
- Many ☐

E. Drainage Class (6 points)

- Excessively drained ☐
- Well-drained ☐
- Moderately well-drained ☐
- Somewhat poorly-drained ☐
- Poorly-drained ☐

F. Rock Fragments (2 points)

- None or few ☐
- Common ☐
- Many ☐

G. Available Water Holding Capacity (6 points)

- High ☐
- Medium ☐
- Low ☐

H. Slope (6 points)

	Middle and East Tennessee	West Tennessee
Nearly level	0 to 2% ☐	0 to 2% ☐
Gently sloping	2 to 5% ☐	2 to 5% ☐
Sloping	5 to 12% ☐	5 to 8% ☐
Moderately steep	12 to 20% ☐	8 to 12% ☐
Steep	20 to 30% ☐	12 to 20% ☐
Very steep	30% or more ☐	20% or more ☐

I. Erosion (3 points)

- None to slight ☐
- Moderate ☐
- Severe ☐

J. Position of Site on the Landscape (5 points)

- Flood Plain ☐
- Upland or terrace ☐
- Footslope ☐
- Depression ☐

PART II INTERPRETATION OF SOIL CHARACTERISTICS

A. Land Capability Class (4 points)

Class I ☐
Class II ☐
Class III ☐
Class IV ☐
Class V ☐
Class VI ☐
Class VII ☐

B. Check Limitation(s) of This Soil for Crop Production (8 points)

1. Wetness ☐
2. Slope ☐
3. Texture of surface soil ☐
4. Texture of subsoil ☐
5. Available water capacity ☐
6. Rock fragments or rock outcrop ☐
7. Effective depth ☐
8. Flooding ☐

C. Check Estimated Yields on This Soil for the Following Crops (7 points)

	Low or not adapted	Medium	High
Corn	☐	☐	☐
Cotton	☐	☐	☐
Soybean	☐	☐	☐
Tobacco	☐	☐	☐
Small Grain	☐	☐	☐
Alfalfa	☐	☐	☐
Fescue-white clover	☐	☐	☐

D. Potential Environmental Problems (4 points)

	Low	Medium	High
1. Sediment, nutrients or pesticides in streams	☐	☐	☐
2. Nutrients or pesticides in groundwater	☐	☐	☐

PART III MANAGEMENT PRACTICES

A. Check The One Most Intensive Recommended Use (6 points)

1. Continuous annual crops - minimal conservation system ☐
2. Continuous annual crops - intensive conservation systems ☐
3. Annual crops in rotation with perennial grass/legume ☐
4. Permanent grass/legume cover ☐
5. Trees ☐

B. Check All Recommended Practices (9 points)

1. Drainage system ☐
2. Conservation tillage/no-till ☐
3. Terraces ☐
4. Grassed waterways ☐
5. Contour farming ☐
6. Strip cropping ☐
7. Filter strips ☐
8. Cover crops ☐
9. Lime and fertilize by soil test ☐

PART IV HOMESITES

A. For Each Soil Factor Check Suitability Rating for Homesite Requiring Septic Tank Disposal Field (12 points)

Drainage	Good ☐	Fair ☐	Poor ☐
Flooding	Good ☐	Fair ☐	Poor ☐
Depth	Good ☐	Fair ☐	Poor ☐
Slope	Good ☐	Fair ☐	Poor ☐
Percolation Rate	Good ☐	Fair ☐	Poor ☐
Shrink-Swell	Good ☐	Fair ☐	Poor ☐

B. Suitability for Homesite Requiring Septic Tank Disposal Field (4 points)

Good ☐ Fair ☐ Poor ☐

The National 4-H Creed

I believe in 4-H Club work for the opportunity it will give me to become a useful citizen.

I believe in the training of my HEAD for the power it will give me to think, to plan and to reason.

I believe in the training of my HEART for the nobleness it will give me to become kind, sympathetic and true.

I believe in the training of my HANDS for the ability it will give me to be helpful, useful and skillful.

I believe in the training of my HEALTH for the strength it will give me to enjoy life, to resist disease and to work efficiently.

I believe in my country, my state, and my community and in my responsibility for their development.

In all these things I believe, and I am willing to dedicate my efforts to their fulfillment.

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COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS.

The University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county governments cooperating in furtherance of Acts of May 8 and June 30, 1914.

Agricultural Extension Service, Billy G. Hicks, Dean