8-2009

4-H Land Judging in Kentucky

David C. Ditsch
University of Kentucky, david.ditsch@uky.edu

Lloyd W. Murdock
University of Kentucky, lmurdock@uky.edu

William O. Thom
University of Kentucky, william.thom@uky.edu

Monroe Rasnake
University of Kentucky, mrasnake@uky.edu

Greg Schwab
University of Kentucky, gjschw2@uky.edu

COOPERATIVE EXTENSION SERVICE • UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, LEXINGTON, KY, 40546
4BA-08MG

4-H Land Judging in Kentucky

David Ditsch, Lloyd Murdock, Bill Thom, Monroe Rasnake, and Greg Schwab, Department of Plant and Soil Sciences

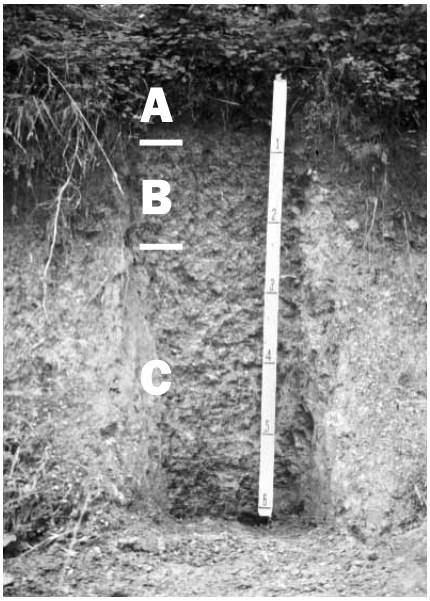


Figure 1. *A pit or road bank provides good ways to see the different horizons in a soil profile.*

Figure 2. *Soil probes can be used to collect soil profile samples.*

Land judging is a way of appraising the physical nature and capability of soils. Certain soil properties, such as slope, depth and color, and others that can be seen, felt or measured, are reliable indicators of soil characteristics.

Land judging does not replace soil testing. Laboratory tests that determine the chemical and physical nature of soil help us predict plant response to lime and fertilizer, estimate the amount of a waste product that can be safely applied to the soil and determine the limitations for various uses such as homesites and roads.

In one way or another, people have always judged soil. Early settlers observed the kinds of trees predominant in the forest. They knew that a poplar forest indicated a different soil than a beech or red oak forest. People judge soil for many different reasons: farmers judge soil when buying land and planning farm operations; a house builder judges soil for its suitability for a good foundation and for septic tank operation; road builders judge soil in designing stable roadbeds; and a regulatory agency may judge soil for its suitability as an environmentally safe landfill.

This publication provides instruction on basic soil concepts that can be easily applied to agricultural, industrial, residential, and recreational land uses in Kentucky. It provides characteristics to be judged as well as a good working knowledge of soil.

Digging a pit or cleaning away a road cut is a good way to see the different horizons in a soil profile (figure 1). Soil scientists do this to describe and study each type of soil. Soil core samplers also provide a good method for studying soil (figure 2). The soil profile can be lifted out in sections in the form of soil cores. These can be laid out to show the whole profile. If a core sampler is not available, a screw auger can be used to get samples of soil at different depths.

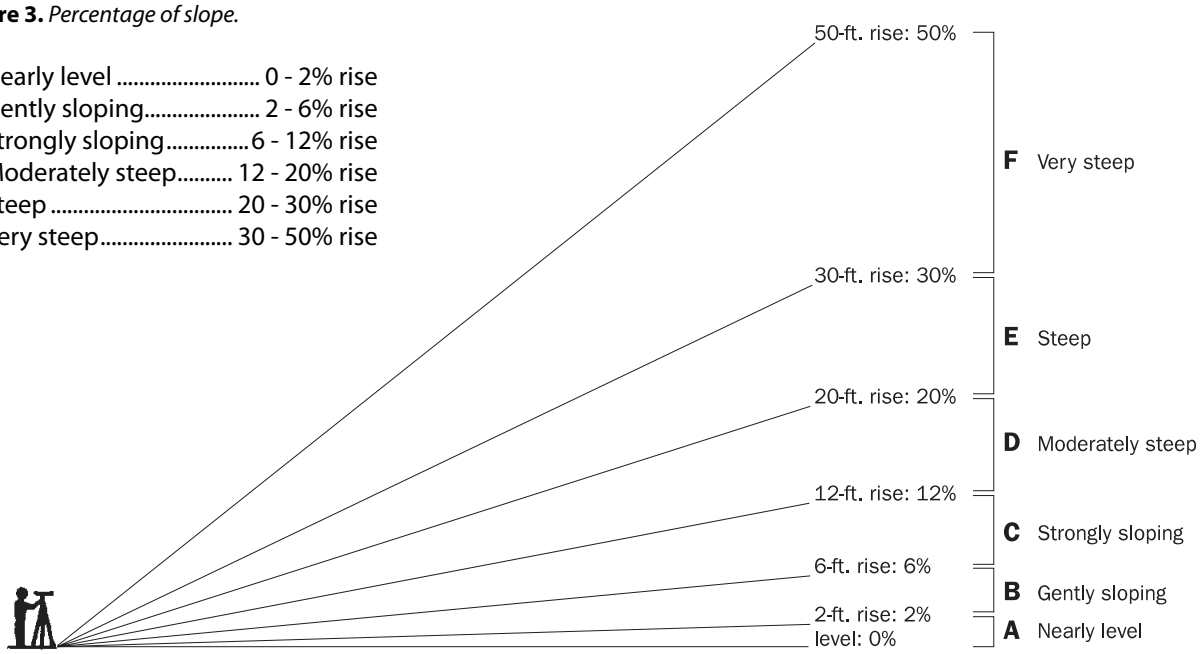
Slope

The percentage of slope is the number of feet rise or fall in 100 feet of level distance (figure 3). Slope should always be determined in the line of natural water flow.

Slope is a very important soil characteristic, for it affects the soil in many ways. It is helpful to be able to judge slope fairly well without any optical aid.

Figure 3. *Percentage of slope.*

A Nearly level ..... 0 - 2% rise
B Gently sloping..... 2 - 6% rise
C Strongly sloping.....6 - 12% rise
D Moderately steep..... 12 - 20% rise
E Steep ..... 20 - 30% rise
F Very steep..... 30 - 50% rise



Using a Slope Finder

A slope finder is useful in training the eye to estimate slope. A slope finder is in the back of this book for your use. To use it, you should:

1. Cut it out of the book and mount it on stiff cardboard, plywood, or another light board (figure 4).
2. Place nails or pegs for sighting pins and weight support.
3. Suspend a weight, such as a small bolt by a string, as indicated.
4. Attach a handle, such as a piece of board sawed out in the shape of a pistol grip, to hold the finder steady (figure 4).
5. To find the percentage of slope:
   - Hold the finder so that the sighting pins and an object at your eye level (either up or down the slope) align (figure 5).
   - Allow the weight to swing freely.
   - Press the string down with your finger (while it still registers slope), or tilt the finder so the weight brings the string tight against the finder; then lower the finder and read the percentage of slope directly from the scale. The percentage of slope is shown where the string crosses the degree line.

Figure 4. *A slope finder is useful to determine slope.*

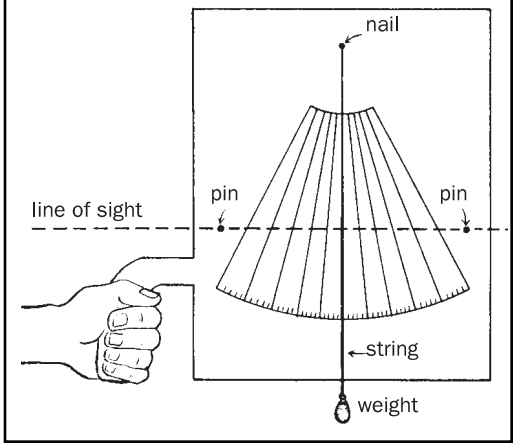
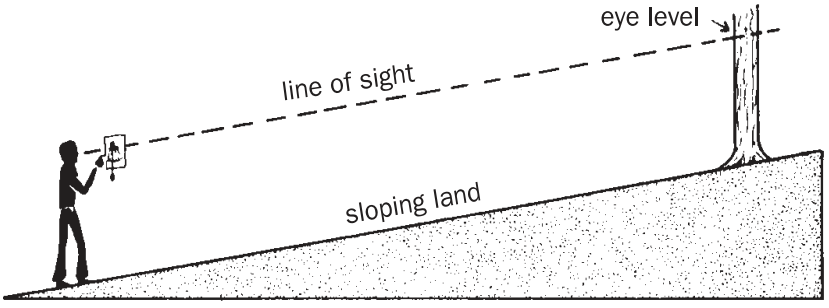


Figure 5. *Align the slope finder with an object at eye level.*



Erosion

Erosion is the wearing away of land by detachment and transport of soil by water or wind. In Kentucky, most erosion is the result of water falling and flowing over the land. Sloping land that has been disturbed by cultivation or construction usually has subsoil material mixed with the topsoil because of erosion.

An upland topsoil forms over many centuries as organic matter from decaying vegetation becomes a part of the soil. The best soils have 7 inches or more of topsoil material. On the other hand, some steep land has never formed as much as 7 inches of topsoil due to the relatively rapid natural erosion.

The amount of erosion affects the physical properties of the surface soil and influences the productivity potential of the land.

In land judging, the amount of erosion is determined by measuring or estimating the amount of topsoil and subsoil contained in the top 7 inches of soil (figure 6). Comparing a soil core from a nearby fence row that has not been plowed with a core from the site being judged should be helpful in determining the amount of mixing of top soil and subsoil in the top 7 inches due to cultivation.

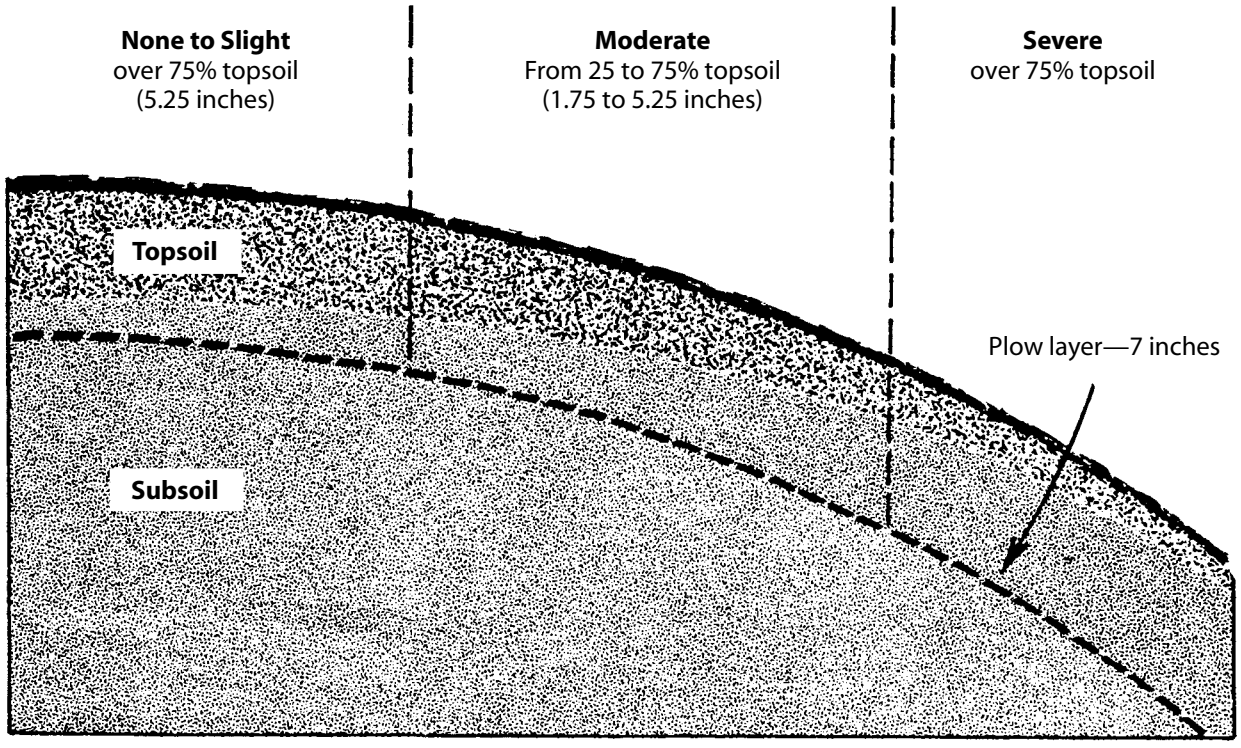
Degrees of Erosion

None to slight—at least 75% (5.25 inches) topsoil or not over 25% (1.75 inches) subsoil in top 7 inches.

Moderate—between 25% and 75% topsoil in top 7 inches.

Severe—less than 25% topsoil or over 75% subsoil in top 7 inches.

Figure 6. *Amount of erosion is determined by estimating the proportion of topsoil to subsoil in the top 7 inches of soil.*



Texture and Workability

In judging workability, you must consider the physical suitability of the soil's surface layer. This includes (1) the power required to move equipment through the soil and (2) the relative amount of time sufficient moisture will be available to cultivate the soil.

A clue to workability is how easily the soil crumbles (figures 7, 8 and 9). Soil texture (size of the individual soil particles) and the amount of organic matter in the plow layer are the primary factors influencing workability.

The texture of the soil is determined by the percentages of sand, silt and clay (figure 10) particles in the plow layer. You can determine this in the field by rubbing the soil between your thumb and fingers.

1. Individual **clay** particles are too small to be seen without the aid of an electron microscope. Too much clay in a soil causes it to be sticky when wet, slow to dry and hard and cloddy when dry. Tillage tools are harder to pull through soil with too much clay. This, of course, limits workability.
2. Individual **silt** particles, though larger than clay particles, are still very small, and they must be viewed with the aid of a microscope. When dry, the soil has a floury feeling. A silty soil crumbles better than a clay soil. Many good surface soils in Kentucky are silt loams.
3. **Sand** particles are large enough to give soil a gritty feeling. A sandy soil is loose, breaks up easily and dries out rapidly. All of this favors good workability.

Organic matter, although not considered a part of texture, improves soil structure by aiding in the formation of aggregates of the individual soil particles. The aggregation of soil particles improves soil structure and workability.

Good—Soil crumbles readily; little crusting; silt loam, loam, fine sandy loam.

Medium—Soil somewhat difficult to crumble, tends to form a crust; silty clay loam, clay loam, sandy clay loam.

Poor—Soil sticky when wet; will ribbon out when pressed between thumb and finger; usually cloddy and hard when dry. Forms hard crust; clay, silty clay, sandy clay.

Figure 7. *Soil with good workability crumbles readily.*

Figure 8. *Soil with medium workability is difficult to crumble.*

Figure 9. *Soil with poor workability is usually cloddy and hard.*

Guide for Textural Classification

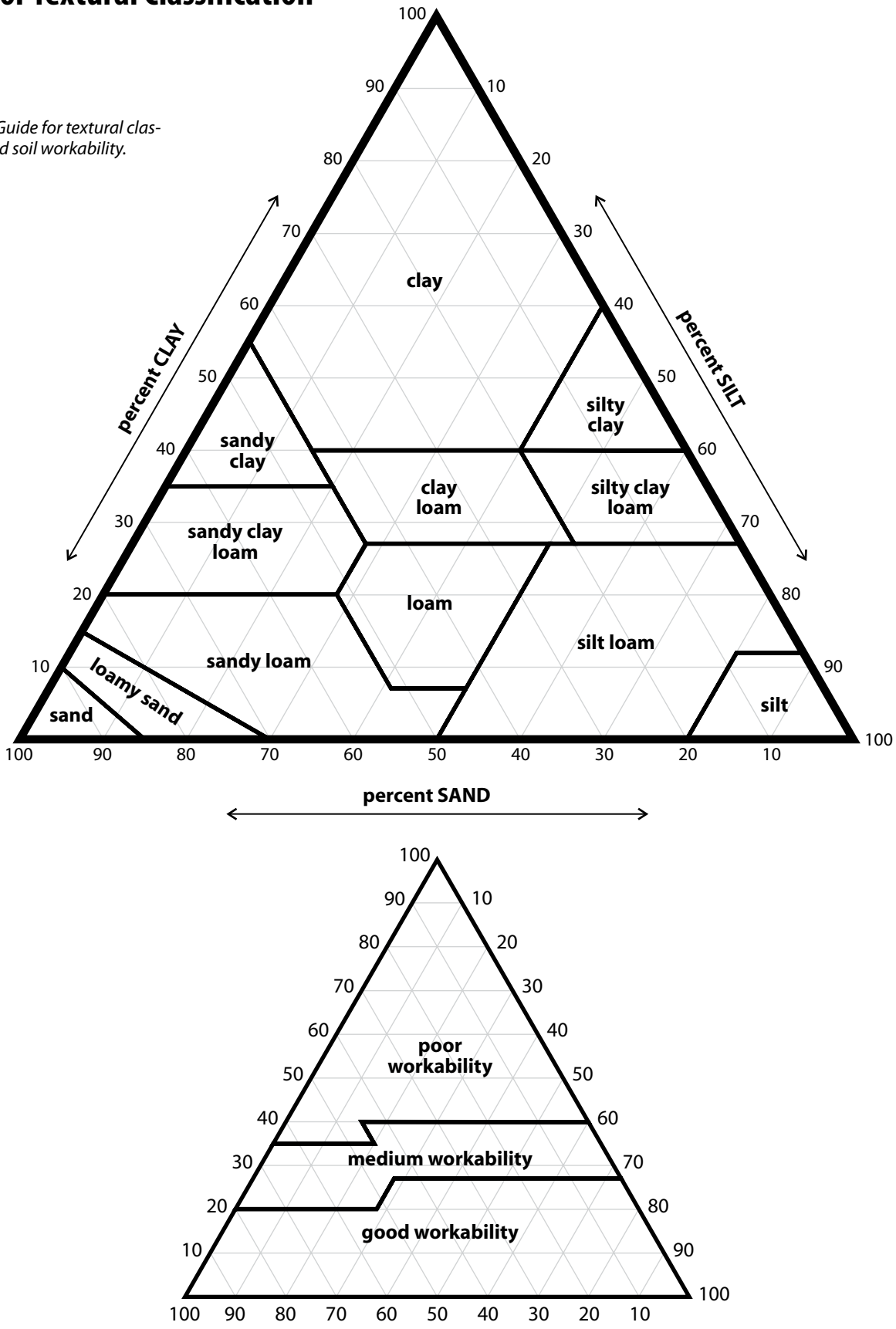


Figure 10. *Guide for textural classification and soil workability.*

Depth of Root Zone

Depth of root zone is the depth to which roots will readily penetrate the soil material to obtain water and nutrients. Some conditions that interfere with root growth are:

Fragipan—A fragipan is a dense, brittle soil layer below the topsoil and subsoil. Silt particles in this layer are cemented together, and roots will not penetrate a fragipan much more than they will solid rock. This layer is a combination of dark brown and reddish brown soil with gray streaks intermingled. The brown and reddish brown soil in a fragipan is brittle, while the gray soil is not. Roots will grow only in these gray streaks. A fragipan can be easily detected when forcing a soil probe into the ground and is considered a soil-forming limitation to the depth of root zone.

Bedrock—Depth of bedrock can be a limitation to plant root development as well as construction projects such as sites for houses with basements, lakes or ponds and swimming pools. This condition limits the depth of root zone. Rock fragments may not limit root growth but will interfere with penetration of the core sampler.

Try several spots or do a little digging with a spade if bedrock is suspected. A very gravelly layer will limit the nutrient- and moisture-holding capacity but is not considered a root-limiting layer.

A shallow water table can limit root growth; however, this is not considered a limitation of root zone in land judging because:

1. Most water tables vary in depth during the growing season, and it is difficult to determine a definite depth.
2. Most water tables can be lowered by drainage, which would increase the depth of root zone.

Root Zone Definitions

Deep—Over 40 inches to a limiting layer (figure 11).

Medium—Limiting layer 20 to 40 inches deep (figure 12).

Shallow—Less than 20 inches to a limiting layer (figure 13).

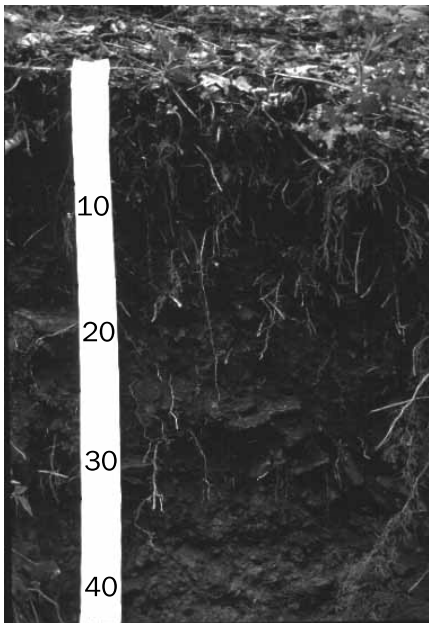


Figure 11. *Deep root zone; roots grow deep to more soil moisture and plant food. Over 40 inches to a limiting layer.*

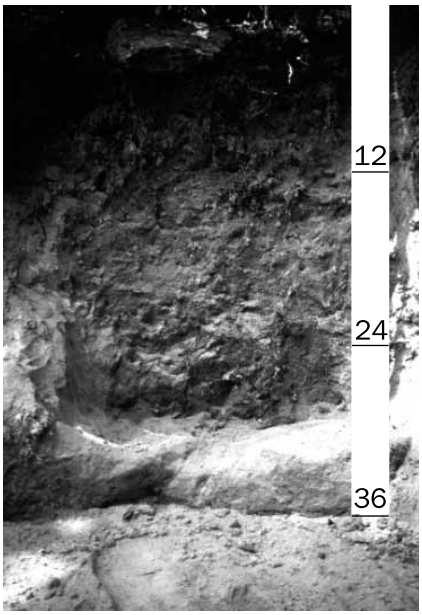


Figure 12. *Medium root zone; bedrock stops roots and shuts off moisture and plant food below. Limiting layer is present 20 to 40 inches from soil surface.*

Figure 13. *Shallow root zone; very little soil over bedrock. Soil dries out quickly and plant-food area is small. Less than 20 inches to a limiting layer.*

Erosion Hazard

When judging erosion hazards, consider the risk of damage to the production capacity of the soil if erosion should occur (figures 14, 15 and 16). The following factors influence the erosion hazard:

Steepness of slope—The same rain will wash more soil from a steep slope than from a gentle slope, other things being equal.

Depth of root zone—An equal amount of soil lost from both a shallow and a deep soil is more damaging to the shallow soil since it has less soil to lose.

Amount of erosion—On severely eroded soils infiltration of rainfall is slower, runoff is greater and erosion hazard is increased.

Degree of Slope		Soil Depth
Erosion Hazard = None to Slight*		
A	0 - 2%	Deep, medium, shallow
B	2 - 6%	Deep, medium
Erosion Hazard = Moderate*		
B	2 - 6%	Shallow
C	6 - 12%	Deep, medium
Erosion Hazard = Severe*		
C	6 - 12%	Shallow
D	12 - 20%	Deep, medium, shallow
E	20 - 30%	Deep, medium, shallow
Erosion Hazard = Very Severe		
F	30 - 50%	Deep, medium, shallow
**Increase erosion hazard one category on severely eroded soils*		

Figure 14. *There is little or no water erosion hazard on level, "A" slope land.*

Figure 15. *As the land becomes more rolling, the erosion hazard increases. The land here would be judged as "moderate" erosion hazard.*

Figure 16. *This land would be judged as "severe" erosion hazard.*

Aeration and Drainage

Aeration is the exchange of air in the soil with air from the atmosphere. Since air is a source of oxygen for the plant roots, air movement within the soil is essential for most crops. When all the porous space in the soil has become filled with water, the soil is saturated (waterlogged) and there is no air movement.

As a soil condition, **drainage** means the frequency and duration of periods when the soil is free from saturation. In a soil where the water moves freely throughout the soil profile, the excess water moves out soon after heavy rains cease. In a very compact soil, water moves very slowly and the soil remains saturated for a much longer period.

Some crops can survive longer than others in a water-saturated soil. For example, tobacco is very sensitive to "wet feet," while fescue will withstand soil saturation for a much longer period. The stage of growth will also influence the length of time the plant can survive without air getting to the root system.

Color of the soil is a good indicator of aeration and drainage. With good aeration, the iron and other minerals in the subsoil are well oxidized (iron rust is iron oxide), and a red color is added to the natural color of the soil. As aeration is more limited, oxidation is reduced, and other changes produce a gray color. When gray and other colors are more or less mixed in irregular patterns, the soil is "mottled," and this is an indication of poor aeration and drainage.

Drainage Conditions

Good—No gray drainage mottling above a 30-inch depth. Subsoil color is usually dark brown, brown, red, or yellow, depending on the kind of material from which the soil was formed (figure 17).

Moderate—Subsoil shows gray drainage mottling between the 20- to 30-inch depth. This is often associated with a soil pan (figure 18).

Poor—Gray drainage mottling or solid gray color develops between the 10- and 20-inch depth (figure 19).

Very Poor—Gray drainage mottling or solid gray color develops in the surface 10 inches. Poor surface drainage may cause the gray color despite pan condition. Surface soil may be very dark gray or black (figure 20).

CAUTION: In a dark soil, mottling is more difficult to detect.

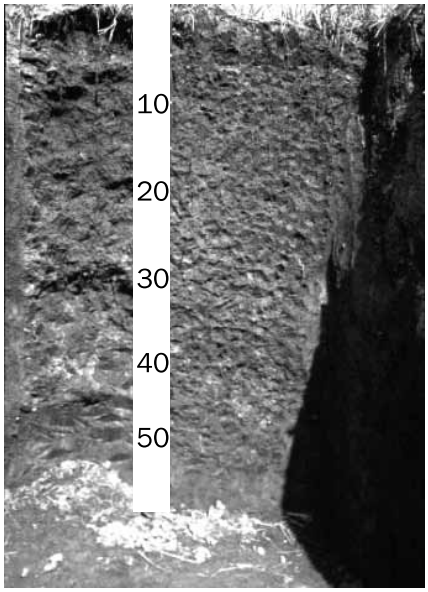


Figure 17. *Good drainage. No gray mottling above a 30-inch depth.*

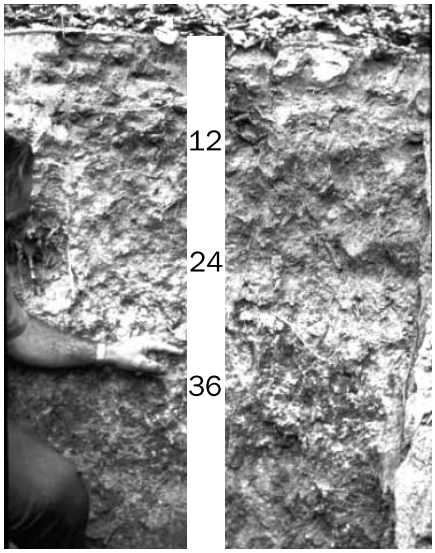


Figure 18. *Moderate drainage. Subsoil shows gray mottling between 20- to 30-inch depth.*

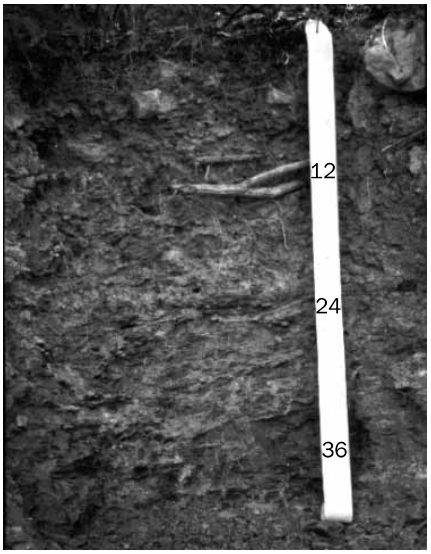


Figure 19. *Poor drainage. Gray mottling or solid gray color develops between 10- and 20-inch depth.*

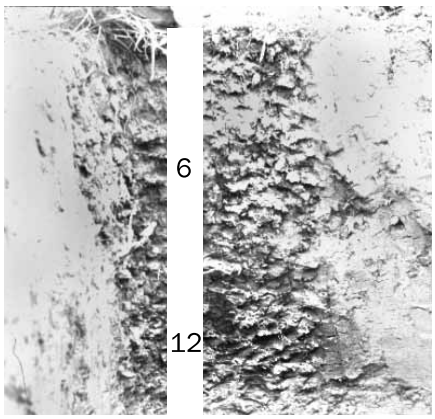


Figure 20. *Very poor drainage. Gray mottling or solid gray color develops in the surface 10 inches.*

The depth of the mottling in the soil profile is used as a guide in judging and an indication of drainage. Some soils have gray colors and mottles because of the parent material of the soil. This is most likely to be in soils that have steep slopes and soils that formed in parent material from different kinds of bedrock (shale). Soils may have seepage out of the hill that causes some mottling, but it is difficult to distinguish drainage mottling from parent material mottling in these soils.

Ability to Supply Moisture

Lack of moisture limits plant growth to some extent nearly every year. Short dry periods may come at critical stages of plant development, such as when ears are forming on corn. Plant growth is affected much more severely in some soils than others, even within the same field. These differences, during dry periods, are related to the ability of the soil to supply moisture.

The following physical characteristics of the soil influence water infiltration, storage and release and are considered when judging the ability of soil to supply moisture.

Depth of Root Zone—The capacity for storing soil moisture is affected by the depth of the root zone.

1. The deeper a given soil, the more water it will hold. A soil 5 feet deep will naturally store more water than the same type of soil only 2 feet to bedrock or a pan condition.
2. Lack of depth hinders (or prevents) the upward movement of moisture. The deeper the root zone the more extensive the root system, which results in more moisture being available to the plant.

Amount of Erosion—Eroded soils generally will not allow water to penetrate as rapidly, and there will be more runoff. Here's why:

1. The organic matter in the topsoil improves soil structure, keeping the soil porous and leaving openings that allow the water to go into the soil instead of running off.
2. As the topsoil with the organic matter is lost, water moves into the soil more slowly due to poorer soil structure.
3. Often erosion exposes soil that has a finer texture than the original topsoil, and the smaller pores slow water intake.

Slope—Runoff is greater on steeper slopes, infiltration is lower, and the soil moisture supply is thereby limited.

Soil Texture—Infiltration, storage and release of soil moisture are affected by a soil's texture. Coarse-textured soils (very sandy) allow water to move in rapidly and will release much of the moisture held, but they store relatively little water and tend to be droughty. On the other hand, soils with fine texture (high clay content) will store a lot of moisture but do not release it as readily to plant roots. Silty soils that fall between these two extremes are best for supplying moisture.

Ability to Supply Moisture	Texture	Root Zone Depth	Slope	Amount of Erosion
Good	Silt loam or fine	Deep	A	All categories
		Deep	B	None to slight or moderate
		Deep	C	None to slight
Moderate	Fine sandy loam or finer	Medium*	A, B, or C	None to slight or moderate
		Deep	D or E*	None to slight or moderate
		Deep	C	Moderate to severe*
		Deep	B	Severe*
Poor	All textures	Shallow*	All slopes	All categories
		Medium	All slopes	Severe*
		Medium*	D or E*	None to slight or moderate
		Deep	D or E	Severe*
		All depths	F	All categories
		All depths	All slopes	All categories

*Denotes limiting factor for ability to supply moisture.

Land Capability and Use

Soils are grouped into capability classes to indicate limitations in use and risks of damage by farming practices. The capability class of a soil indicates its maximum safe use in planning conservation and cropping programs. The most unfavorable soil characteristic usually governs capability.

The land use coupled with each capability (listed below) is the most intensive safe use. (There are exceptions to the capability and use pairings as given here; however, the exceptions depend on technical determinations and are not included in this land judging program.) All needed conservation measures must be used with each land use.

Capability Classes

CLASS I—Soils in Class I have few limitations that restrict their use.

CLASS II—Soils requiring moderate conservation practices or having some limitations restricting choice of crops.

CLASS III—Soils that require special conservation practices or have severe limitations that reduce the choice of plants.

CLASS IV—Soils in this class require very careful management and special conservation practices or have very severe limitations that restrict the choice of plants.

CLASS V—Soils that are not likely to erode but have other limitations, impractical to remove, that limit their use (flooding, stoniness, etc.). Due to limited acreages, this class will not be used in contests.

CLASS VI—Soils having such severe limitations that they are generally unsuitable for cultivation; they are limited largely to pasture and hay production.

CLASS VII— Very severe limitations that make soils unsuitable for cultivation and that restricts their use primarily to forest.

Career Opportunities

Two of the basic needs of all people are adequate food and clothing. A productive soil, along with water, air, light and temperature, is essential in supplying these needs. The treatment, efficient use and conservation of land resources is controlled by people and is of vital concern to everyone as the world faces an increasing population growth. Many career opportunities are available in this field.

Soil scientists are needed to teach people to assess the productive capabilities of their land and the treatment, natural resources, cropping systems, and conservation practices needed for efficient production and maintenance of the productive capacity of soil.

Job opportunities for soil scientists are many and varied, including:

- Cooperative Extension Service
- Teaching in high schools, colleges and universities
- Natural Resources Conservation Service
- Research and other employment with government agencies
- Agribusiness
- Environmental consulting
- Landscape Architecture

If you are interested in more information about careers in soil and plant sciences, request "Career Opportunities" from the Department of Agronomy, University of Kentucky, Lexington, KY 40546-0091, or call (859) 257-7310.

Land Capability Chart		
Slope		
A	0 - 2%**	Class I
B	2 - 6%	Class II
C	6 - 12%	Class III
D	12 - 20%	Class IV
E	20 - 30%	Class VI
F	30 - 50%	Class VII
Amount of Erosion		
None to Slight		Class I
Moderate		Class II
Severe*		Class III
Erosion Hazard		
None to Slight		Class I
Moderate		Class II
Severe		Class III
Very Severe		Class IV
Workability		
Good		Class I
Medium		Class II
Poor		Class III
Depth of Root Zone		
Deep—over 40"		Class I
Moderate—20-40"		Class II
Shallow—under 20"*		Class III
Aeration and Drainage		
Good		Class I
Moderate		Class I
Poor		Class II
Very Poor		Class III
Ability to Supply Moisture		
Good		Class I
Moderate		Class II
Poor		Class III

**Severely eroded or shallow soils: lower capability one class below that indicated by slope. Example: Place a C slope that has severe erosion in Class IV instead of Class III. A combination severely eroded and shallow soil lowers capability one class, not two.*

***Frequent flooding: no higher than Class II. If frequent flooding exists, this information will be given to contestants.*

Conservation Measures and Limitations

Measures

When completing your judging sheet, check "yes" for each measure needed, whether present or not. Check "no" for all other measures.

1. Soil Test, Lime and Fertilizer
Applies to all soils except Class VII.

Soil should be tested and lime and fertilizer applied as recommended. A good fertility level is the key to a good conservation cover of vegetation on crop and pasture lands, as well as profitable levels of production.

2. Contour or Across-slope Cultivation
This practice is always used except for (1) A slopes and (2) Class VII land. This practice protects land from erosion when cultivation is used.

3. Cover Crops or Residue Management
Applies to Class II, III and IV with slopes greater than 2%.

To maintain proper protection from erosion, a cover crop should be established on all sloping cropland without adequate residue for protection. If adequate crop residue is present, it should be left on the surface and properly distributed for maximum effectiveness.

4. No-tillage
Applies to Class II, III, IV and VI land with slopes greater than 2% except soils with very poor aeration and drainage.

All suitable cropland and pasture land should be no-tilled to prevent erosion. If other factors exist to prevent the use of no-till, this information will be made available to the contestants before the contest.

5. Terracing or Strip Cropping
Applies to cropland with slopes greater than 2% and over 100 feet in length. These two measures are used here as alternative choices for any land judging area. If the area is to be no-tilled, then this should be checked "no." (There are cases in which, because of uneven terrain or other conditions, neither terraces nor strips can be laid out on sloping land. These cases involve technical skill beyond the scope of land judging and will not be considered.)

6. Grass Waterway, Mechanical Drains or Other Safe Water Disposal System
Applies where slope, land use and good water management indicate a problem in safe water disposal.

Grass waterway areas may vary from a well-defined stream channel to a slight depression that concentrates water runoff from cropland or pasture land. When a waterway carries a flow of water much of the time, it becomes a small creek, and keeping the waterway in sod is not practical.

Besides natural drains, this practice is required for safe water disposal any time practices five or eight are used.

7. Filter Strip
Applies to Class I, II, III and IV land adjacent to streams, ponds and sinkholes. A strip of close-growing, permanent, herbaceous vegetation that filters sediment, organic material, nutrients and chemicals from field drainage water.

8. Diversion Channel
A constructed channel that catches runoff water from sloping areas above the area being judged and diverts it away from the area being judged. The most common need for this practice is where surface water from a hillside must be diverted to prevent damage to bottomland.

In this case, the diversion channel may be constructed on the slope adjacent to the bottom area but would be needed to provide protection for the area being judged. For this reason, the diversion channel practice should be marked "yes" for the bottom area though it may not be built in the area being judged. On the other hand, if the area being judged is sloping land higher than the bottomland, the practice should be marked "no." Although the channel may be at the foot of the slope of the area being considered, it is a practice necessary for protection of the lower ground beyond the area being judged.

9. Drainage
Tile or open ditch drainage applies when aeration and drainage are poor or very poor on A or B slopes.

This practice may be restricted due to recently imposed restrictions in Federal legislation. Contestants will be told of any restrictions.

10. Pasture Seeding and Fertilizing
Applies to Class VI l and without regard to present use. Includes seeding, liming, fertilizing and good management practices. Pasture improvement for production also improves conservation values of pasture.

11. Forest Planting and Management
Applies to Class VII land. Includes new planting, interplanting, protection from fire and grazing and other good forest management.

Limitations

Each factor that would prevent the site from being in Class I capability must be checked.

Check if:

1. Slope—over 2%
2. Erosion—moderate, severe
3. Erosion Hazard—moderate, severe or very severe
4. Texture and Workability—medium or poor
5. Depth—less than 40 inches
6. Drainage and Aeration—gray mottling within 20 inches of surface
7. Ability to Supply Moisture—moderate or poor
8. Flooding

Land Judging Terms

The terms defined below are used in land judging. To fully understand land judging, you may need other terms defined for you. You can find many of these definitions in the glossary (page 751) of *Soil, The 1957 USDA Yearbook of Agriculture.*

Aeration
The exchange of air in soil with air from the atmosphere.

Aggregate
Many fine soil particles held together in one mass or cluster, such as a clod or crumb.

Bedrock
Solid rock underlying soil.

Clay
The very fine mineral soil particles.

Clod
A hard mass of soil produced by plowing or digging; it melts when wet.

Concretion
A hard pellet of soil particles cemented together by compounds in the soil.

Contour
A line across a slope that is level throughout its course.

Erosion
Wearing away of land by detachment and transport of soil by water or wind.

Fertility
Ability of soil to provide plant nutrients in sufficient amounts and proper balance for plant growth.

Fragipans
Dense and brittle pans or layers in soils that owe their hardness mainly to compaction, high silt content and cementation.

Horizon
A layer of soil with distinct characteristics produced by soil-forming processes that distinguish it from other layers in a soil profile.

Humus
Well-decomposed organic matter in mineral soils.

Land
The whole environment of growing plants, including soil, water supply, plant cover, works of improvement and other characteristics.

Land Capability Classification
Grouping of soils into units according to their capabilities for use in farming and treatments required for sustained use.

Leaching
The downward movement of materials through soil pore space by water.

Mineral Soil
Composed mostly of mineral matter, not organic matter.

Mottled
Soil irregularly spotted with gray colors.

Pan
A soil layer that is firmly compacted. Fragipans, high in silt, are common in Kentucky. Claypans, high in clay, are less common. Traffic pans result from soil usage, not soil-forming processes.

Parent Material
The material from which the soil profile develops.

Plow Layer
The soil ordinarily moved in tillage or its equivalent in uncultivated soil, about 7 inches thick.

Pore Space
The space between solid particles that is filled with either air or water.

Profile
A vertical section of soil extending from the soil surface into parent material.

Runoff
Surface flow of water from an area.

Silt
Soil particles of a size between clay and very fine sand.

Slope
The incline of soil surface.

Strip Cropping
Growing cultivated and meadow crops in alternate strips on the contour.

Stoniness
Stony land has a high percentage of small stones that prevents mechanical tillage.

Terrace
A ridge constructed across a slope on a slight grade.

Terrace Soil
Second bottom soil, deposited by running water, with some degree of profile development.

Water Table
The upper portion of the soil profile where all pore space is saturated with water. Location of a water table is determined by the level at which water stands in a shallow open pit.

Setting Up and Conducting a Land-Judging School or Contest

To have a successful land-judging event, planning and coordination are necessary from the beginning. The Extension agent usually chairs the event, but another interested party could serve in this capacity. Persons most likely to be involved are sponsoring groups, Cooperative Extension Service and Natural Resources Conservation Service personnel, vocational agriculture groups or local leaders.

Here's how to prepare for an event:

Before the Event:

1. Set the date of the school or contest.
2. Determine expected participation, if possible.
3. Locate a comfortable classroom setting for organization, instruction, etc.
4. Locate a farm or adjacent farms where different conditions can be found to study and judge.
5. Secure permission from the owner to use the selected area.
6. The day before the contest, have designated soil scientists select sites and locations for sampling profile and make official scorings and placings. (The cores can be preserved by pouring acrylic floor wax on them after they dry, or they can be moistened frequently during the contest.)
7. Prepare land judging cards for each individual. Combine cards in packages of four when judging by teams. Number the cards so teams can be easily separated and scores regrouped.
8. Select group leaders and tabulators (graders).
9. Allow 1 to 1-1/2 hours (longer for schools) in the morning for organization, instruction, etc.
10. Allow about 1-1/2 hours for judging.
11. Arrange for transporting contestants to the fields.

Selection and Scoring of Sites

The contestants or students must be able to see the soil to determine important characteristics. While suitable roadside cuts and ditches may be used for training purposes, a site away from a road or ditch is preferable for a contest.

Four fields are used in judging. The fields used in the contest should be selected and scored by soil scientists of the Natural Resources Conservation Service, Cooperative Extension Service, etc., using the Land Capability Classification as defined in this publication.

All scoring should be kept confidential by the judges until after the contest is completed. It is beneficial to the students if, after the contest, the judges explain their scores to the contestants.

Site Size

The fields to be judged should be a minimum of 100 feet x 100 feet. Flags or stakes must be set to indicate the boundary of the area to be considered and where the profile sample is to be taken.

A different color flag or stake should be used to indicate a 100-foot distance for estimating slope *(figure 21)*.

Core Sample

At each site, have the official sample of the soil profile laid out on a board or holder. Do not allow contestants to handle the samples.

Provide probes or augers at each site so the contestants can take and handle their own samples. They can measure the thickness of the topsoil, determine its texture and workability, depth, and aeration and drainage. Also provide bottles of water for moistening the soil if needed.

The Day of Event

1. Break the contestants or students into four groups so that no two members of the same team are in the same group.
2. Arrange for a grading place and someone to bring in the cards as contestants finish a field.
3. Allow 15 minutes at each of the four sites and have groups move to the next site on a predetermined signal.

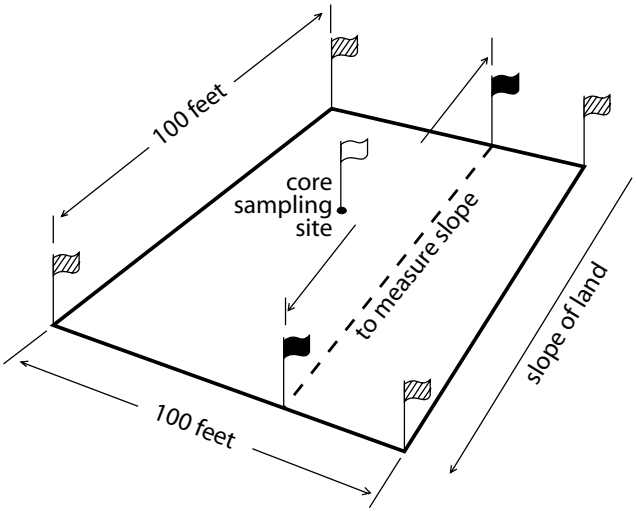


Figure 21. *Select a group of four fields for judging. Within each field, select a uniform sample area marked by a flag or stake to represent the field. Sample areas do not have to be square. Set slope stakes.*

Land Judging Score Card*

Soil Characteristics

Place a check mark in only one square for each characteristic on each site.

5 points for each correct answer		Site 1	2	3	4
Slope	A 0-2%				
	B 2-6%				
	C 6-12%				
	D 12-20%				
	E 20-30%				
	F 30-50%				
Amount of erosion	None to slight				
	Moderate				
	Severe				
Texture and workability	Good				
	Medium				
	Poor				

5 points for each correct answer		Site 1	2	3	4
Depth of root zone	Deep				
	Moderate				
	Shallow				
Erosion hazard	None to slight				
	Moderate				
	Severe				
	Very severe				
Aeration and drainage	Good				
	Moderate				
	Poor				
	Very poor				
Ability to supply moisture	Good				
	Moderate				
	Poor				

Name _____

Address _____

_____

SCORING—5 points for each correct answer

Score—this page _____ (140 possible)
Score—back page _____ (216 possible)
Total score _____ (356 possible)

Division:
☐ Junior
☐ Senior

** This scorecard is available for training and contests as Land Judging Scorecard, 4BA-09SD.*

Land Capability and Conservation Measures

Place a check mark in the one square indicating the most intensive use that can be made of land for each site. Assume recommended conservation and management practices are followed. Score 5 points for each correct answer for LAND CAPABILITY.

		Site			
Class	**Land Capability**	**1**	**2**	**3**	**4**
I	Very intensive cropping				
II	Intensive cropping				
III	Moderate cropping				
IV	Occasional cropping				
V	Continuous cover				
VI	Continuous cover				
VII	Continuous cover (forest)				

Major factors that keep site out of Class I. Correct answer must include each factor preventing the site from being Class I. Score 5 points for correct answer on each site.

	Site			
Limitations	**1**	**2**	**3**	**4**
Slope				
Erosion				
Erosion hazard				
Texture and workability				
Depth				
Aeration and drainage				
Ability to supply moisture				
Flooding				

Check one square per site for each category. Score 4 points for each correct answer.

			Site			
Conservation Measures			**1**	**2**	**3**	**4**
1.	Soil test, lime and fertilizer	**yes**				
		no				
2.	Contour or across the slope farming	**yes**				
		no				
3.	Cover crops or residue management	**yes**				
		no				
4.	No-tillage	**yes**				
		no				
5.	Terracing or strip cropping	**yes**				
		no				
6.	Grass waterway mechanical drains, etc.	**yes**				
		no				
7.	Filter strip	**yes**				
		no				
8.	Diversion channel	**yes**				
		no				
9.	Drainage tile or open ditch	**yes**				
		no				
10.	Proper pasture management	**yes**				
		no				
11.	Proper forest management	**yes**				
		no				

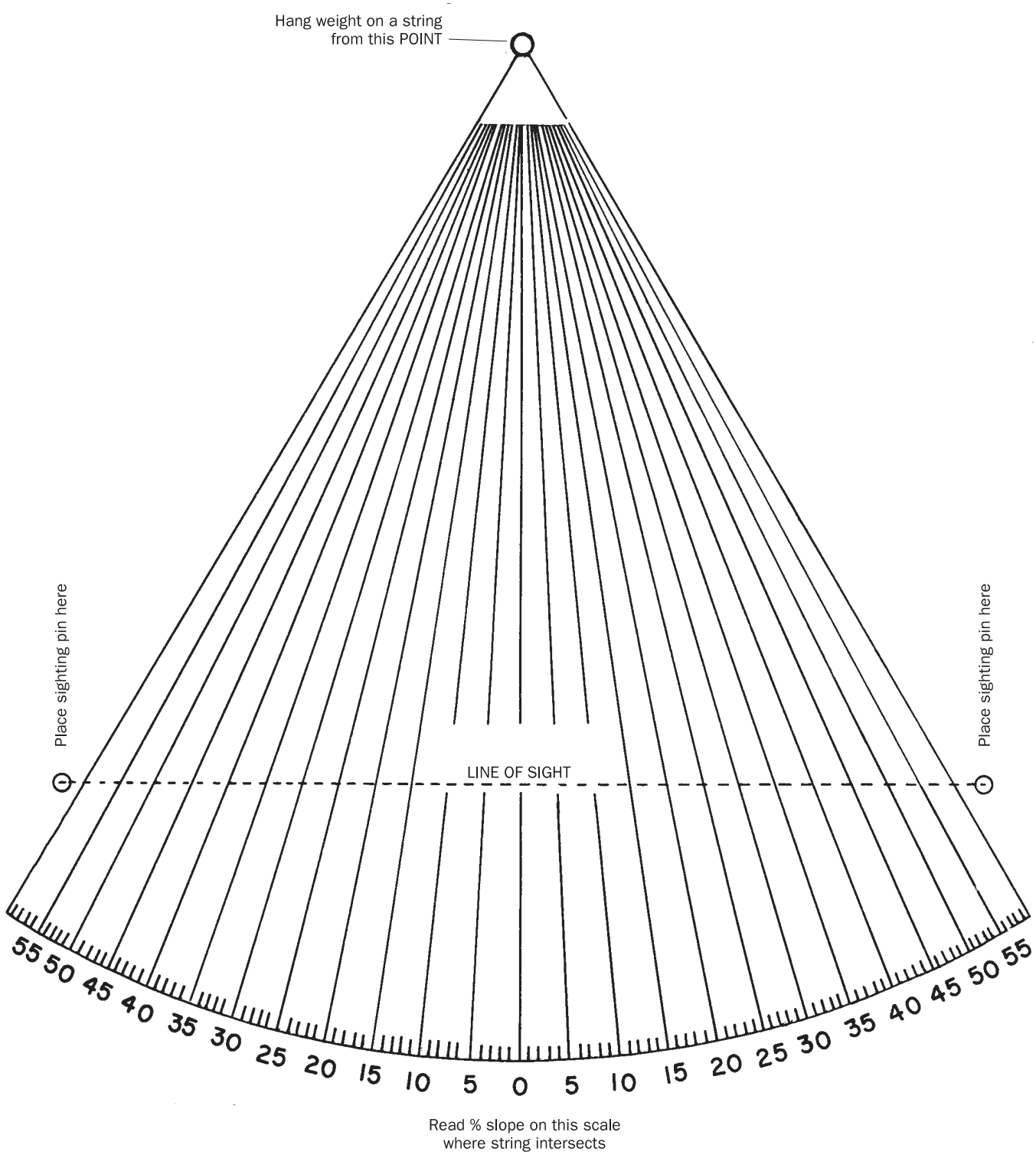
Tie-Breaker Policy:

In the event of a total score tie, use the following land judging category score to determine winners:

1. Conservation Measures (if a tie still remains, refer to the next category).
2. Limitations (if a tie still remains, refer to the next category).
3. Land Capability.
4. Soil Characteristics (if a tie still remains, refer to the slope section of the Soil Characteristics category).

Slope Finder

For farm mapping project.



Special credit and thanks go to George Ballard and Frank Cox of the Soil Conservation Service and to Charles Metcalfe and Bill Turpin, teachers of vocational agriculture, for their ideas and suggestions in preparing this publication.

Thanks also to the Farm Credit Banks for their support of the land-judging program.