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"Know Your Land" Program for South Dakota

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"Know Your Land"

PROGRAM

for SOUTH DAKOTA



COOPERATIVE EXTENSION SERVICE
SOUTH DAKOTA STATE COLLEGE
U. S. DEPARTMENT OF AGRICULTURE

"Know Your Land" Program for South Dakota

By E. J. Williamson, Robert Papendick, and Lloyd E. Davis,
Extension Soil Specialists

Purpose and History

A systematic study of the soil is the basic tool for determining the capabilities and limitations of land. Land judging is used to teach and promote a better understanding of soils through a study of the physical properties of the soil and to show how to use these properties in determining proper land use. Most of the characteristics that are used to identify soils can be determined in the field.

The ultimate objective in land judging is land classification. After classification has been determined, the use to be made of the land and a treatment in accordance with its use is recommended.

Land is judged in the field by inspecting the soil in its natural state. The features that tell us about the character of the soil are determined by sight and by touch. To make the correct decisions we must understand what forms the good and poor qualities in land. To a large extent the same principles that apply in crops and livestock judging are used in land judging. The soil factors discussed in later pages provide clues from which to determine land quality and best use.

Land judging contests, which are relatively new in South Dakota, originated in Oklahoma. They grew out of annual 4-H and FFA Soil Conservation Schools held since 1941 at The Red Plains Conservation Experiment Station, Guthrie, Oklahoma. In 1946, land judging was taken to the field. Edd Roberts, Extension

Conservationist, Oklahoma A & M College, Stillwater, Oklahoma; and Harley Daniel, Project Supervisor, Red Plains Station, were the inventors of land judging.

A "Know Your Land" program in South Dakota was started in 1953 at the 4-H Conservation Camp with 20 4-H boys and county agents participating. However, it was not until 1954 that an intensive program was developed cooperatively under leadership of the Extension Service and Soil Conservation Service. This program was developed as an educational tool to help youth as well as adults to determine soil capabilities and proper land management. Land Appreciation Schools consisting of illustrated classroom discussion, a field trip, and actual judging were held for Vocational Agricultural Instructors, Veteran Farm Instructors, Work Unit Conservations, and County Agents throughout the state.

The first area contest was held in Mitchell in the fall of 1954, sponsored by the Mitchell National Bank. Presently, the East River section of the state is divided into four areas with annual contests being held at Mitchell, Sioux Falls, Watertown, and Aberdeen.

The purpose of this booklet is twofold: a source of organized material for teachers to use in conducting Know Your Land appreciation schools in preparation for a judging contest and information relative to the score card to be used in the contest.

Land Appreciation Schools

Land Appreciation Schools are usually held before a judging contest. In these schools you will learn that soil depth, texture, permeability, slope, and other factors determine the class of land. This classification of land is the key for using and treating land properly. The names of conservation practices, what they are, and how they are used will also be learned.

Land Appreciation Schools and Land Judging Contests are valuable for all groups—young people, farmers, business and professional people, and public school and college students. Grouping can be 4-H and leaders, Vocational Agricultural Classes, Veterans Training Groups, and farmers.

The schools may be held anytime from April to October. Saturdays have proven to be poor days and are not recommended unless special local conditions make it necessary to use that day.

School Instructors have indicated that a full day, 9:30 a.m. to 3 p.m. is most worthwhile. This requires arrangements for public schools, Vocational Agricultural Departments, and 4-H Clubs during school time. Certain times of the year may be more desirable.

The schools and contests may be held by any interested group in any county or soil conservation district in the state. They require coordination, planning, and organization. County Agents contact representatives of all agricultural and other interested agencies, tell them of the proposed land appreciation school and judging contest, and ask them to participate and assist according to their means.

Staging this event requires a full day. The explanation at the school of the various land factors to be studied should be given in a class room or comfortable building using approximately 2 or 2½ hours in the morning. In the afternoon, make a field trip to a selected farm for the contest.

Land Judging Contests

Usually four fields are used in each contest and are numbered 1, 2, 3, and 4. A pit or hole is dug in each field, exposing a verticle cross section of the soil to a 4 to 5 foot depth. The soil texture, depth, permeability, and erosion of the soil can then be determined. A sample of topsoil and subsoil may be placed near the pit to allow a better chance for seeing and feeling it.

The participant is informed of the total number of conservation practices applicable to each field, as well as original top soil depth, results of soil tests and other pertinent information relative to the field. The following form may be used to provide such information:

- Field No. _____
- Assume soil tests show deficiencies in
 - _____
 - _____
 - _____
 - _____
 - Barnyard manure _____ available.
 - Use _____ management practices.
 - Pay no attention to practices on the field.
 - Thickness of original topsoil was _____

- Size of field to consider is _____ acres.
- Consider most intensive use of the land.
- Other conditions are _____
- Mark _____ limiting factors.

The official placing for each field is done before the contest by soil scientists. Their decisions are recorded and given to the tabulation committee as the official placings for the scoring of the participants score cards.

Each participant is given a score card for each field to be judged. You should fill in your name or contest number, field number, and other information according to the instructions of the contest leader.

Use of the Score Card

In filling out the score card (see figure 1) the participant will evaluate the seven soil factors necessary for determining the land capability class. These soil factors are **surface texture, permeability, depth, slope, surface drainage, erosion, and surface stoniness**. These factors are described in this circular.

By studying the facts given, feeling the soil, measuring it, and looking at it carefully, the decision as to the capability class in which the land belongs will be made.

The estimates of these factors are recorded on the score card. On Part I of the score card, the number preceding the contestant's choice of the terms is circled. For example, under "Surface Texture," if the contestant's estimate is "Medium Texture," the number 2 preceding the word "Medium" is circled.

A soil factor must be regarded as being limiting if it cannot meet the Class I Land Capability standards. Consequently, any factor which limits the use of land is regarded as a "limiting factor" and should be circled by appropriate number under the **Limiting Factor** heading on the score card. Once the number of limiting factors have been determined, the severity of any one or a combination, determine the "Land Capability Class." A guide for determining Land Capability Classes according to the severity of the limiting factors is presented in table I. Climate is considered a limiting factor in South Dakota with exception of lands in the south eastern counties. After the land capability classes has been determined the participant circles the class number on the score card.

Part II of the score card is the choice of land management practices. Part II is divided into three sections—**Vegetative, Mechanical and Supporting Practices for Erosion Control, and Fertilizer and Soil Amendments**. It may be necessary to use practices from all three groups to properly treat the field. These practices are defined in this circular.

The first thing to do in Part II is to decide how the field should be used. For example, suppose in evaluating the factors of Part I the land was found to be Class III. From the Land Capability Class definitions the **most intensive** use for Class III is cultivation. This class could be used for pasture but that is a **less intensive** use. So, remember in Land Judging always choose

Figure 1

Field No.....	SCORE CARD	Contestant No.....
		Group No.....
Know Your Land Program		
Extension Service, South Dakota State College		
Name.....		Score Part I.....
Address.....		Score Part II.....
County.....		Total Score.....

<p>PART I—SOIL FACTORS</p> <p>Possible Score 30 Points</p> <p>(Circle Number of Correct Answer for Each Soil Factor)</p>	<p>PART II</p> <p>Recommended Soil Management Treatment</p> <p>Possible Score 30 Points</p>																						
<p>A. SURFACE TEXTURE</p> <p>1. Sandy (coarse) 2. Loamy (medium) 3. Clayey (fine)</p> <p>B. MOVEMENT OF AIR AND WATER IN SUB-Soil (permeability)</p> <p>1. Slow 2. Moderate 3. Rapid</p> <p>C. DEPTH FAVORABLE FOR PLANT ROOTS</p> <p>1. Deep 36" or more 2. Moderate 20"—36" 3. Shallow 10"—20" 4. Very shallow under 10"</p> <p>D. SLOPE</p> <p>1. Nearly level 0—3% 2. Undulating 3—6% 3. Sloping 6—10% 4. Rolling 10—20% 5. Steep 20% or more</p> <p>E. SURFACE DRAINAGE (Runoff)</p> <p>1. Poor 2. Fair 3. Good 4. Excessive</p>	<p>F. EROSION-WIND AND WATER</p> <p>1. None to slight 2. Moderate 3. Severe</p> <p>G. STONINESS</p> <p>1. None to slight 2. Moderate 3. Excessive</p> <p>H. LIMITING FACTORS</p> <p>1. Texture 2. Permeability 3. Depth 4. Slope 5. Drainage 6. Erosion 7. Stoniness 8. Climate</p> <p>I. LAND CAPABILITY CLASSES</p> <p>1. I 2. II 3. III 4. IV 5. V 6. VI 7. VII 8. VIII</p>																						
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PART TWO—SOIL MANAGEMENT PRACTICES

(Record your recommended treatments in the squares on the other side of this card)

VEGETATIVE

1. Use legumes and/or grass one half of the time in the rotation.
2. Use legumes and/or grass one third of the time in the rotation.
3. Use legumes and/or grass one fourth of the time in rotation.
4. Plow under crop residue.
5. Incorporate crop residue with the surface soil.
6. Leave crop residue on the surface soil.
7. Establish or plant tree belts.
8. Establish recommended grasses and/or legumes.
9. Control grazing.
10. Renovate and seed recommended mixtures.
11.
12.

Mechanical and Supporting Practices Erosion Control

13. Diversion terraces
14. Use wind strip cropping
15. Farm on the contour
16. Terrace and farm on contour
17. Install drainage system
18.

Fertilizer and Soil Amendments

19. Manure
20. Nitrogen
21. Phosphate
22. Potash
23. Nitrogen and Phosphate
24. Nitrogen, phosphate and potash

the most intensive use for the Class of land selected in Part I.

To go on with the example, the first step then would be to select from the list of practices, those necessary to conserve soil and maintain or improve productivity. Record these by number in the squares afforded on the front of the card.

It is recommended that a total time of 20 minutes be spent on each field, examining it and making entries on the score card. In practice and training work, the time factor may be eliminated. A smaller number of fields may be used for training and practice work depending upon local conditions.

Table I—Guide for Selecting Land Capability Classes in South Dakota

Soil Factor	Best Land Class Possible	
Texture, (Surface)		
Medium (Loamy Soils).....		I*
Fine (Clayey Soils).....		II
Coarse (Sandy Soils).....		III
(a) Incoherent sands would be placed in Class VII		
Permeability of Underlying Material		
Moderate.....		I*
Slow or Rapid.....		II
Depth Favorable for Plant Roots (Surface and Subsoil)		
Deep (36" or more).....		I*
Moderately Deep (20" to 36").....		III
Shallow (10" to 20").....		VI
Very Shallow (Less than 10").....		VII
(PERMEABILITY)		
Slope		
Nearly level (0-3%).....	East River I*	West River II (18" or more rainfall)
Undulating (3-6%).....	II	III (Less than 18")
Sloping (6-10%).....	III	IV
Rolling (10-20%).....	VI†	VI
Steep (20% or more).....	VII	VII
Surface Drainage		
Good.....		I*
Fair.....		II
Excessive.....		III
Poor.....		IV & V‡
Erosion (existing)		
None to slight.....		I*
Moderate.....		III
Severe.....		VI
Stoniness		
None to slight.....		I*
Moderate.....		IV
Excessive.....		VI

*Due to climatic conditions in South Dakota, Class I land is found only in parts of the southeastern counties: Moody, Minnehaha, Lincoln, Union, Turner, Clay, and Yankton; elsewhere east of the Missouri River this land is Class II. West of the Missouri River, this land is Class II or III depending on total annual rainfall.

†When slopes approach 10 to 16% on "Loess" soils, lands may fall in capability Class IV when no other factors are limiting.

‡Class V when permanent high water table exists otherwise Class IV.

Scoring Land Judging

After Parts I and II have been finished, the score cards are collected. The work is then graded and scored by the judges. Points are awarded for each entry on the score card. The total number of points makes up the participants final score for the field. The perfect score on a field is 60. Thirty points are given on Part I and 30 points for Part II. The perfect score for 4 fields is 240 points.

Here is an example of how judges awarded points on answers given by a contestant. Suppose Field 1 is cultivated cropland, is classified as Land Capability Class III, has a surface texture of clay loam, has a subsoil which is moderately permeable, is a deep soil, sloping, with none to slight wind and water erosion, and has excessive surface drainage. The following is an example of how judges may assign points to Field 1 for the official placing:

Fine Texture.....	2 points
Moderate Permeability.....	3 points
Deep Soil.....	3 points
Sloping Slope.....	4 points
Slight Erosion.....	4 points
Excessive Surface Drainage.....	2 points
Texture, Slope, Drainage — 2 points each (Under Limiting Factor Heading)	6 points
Land Capability Class III.....	6 points
	30 points

Suppose you mark practices 1, 7, 18, and 25 from the soil management practices on the back of the score card. The judges may grade as follows:

1	7	18	25	(Practice Nos.)
(8)	(8)	(8)	(6)	(Points awarded by judges for each practice)

The total number of points bracketed under the squares totals 30, which is a perfect score in this particular example. Had you marked some practice or practices other than ones designated by the judging committee, fewer points would have been received, or perhaps a zero. Judges emphasize the conservation practices having the most important bearing on each specific field problem. In certain localities, the judging committee may consider this practice worthy of more points. The judging committee is authorized to determine how many points should be awarded to the participants for each of their answers. Participants will have different ideas about conservation practices on a field. There may be occasions when the judging committee will consider optional practices for a field. It is suggested that points for the optional practice be less than the figure for the practice having the least number of points assigned.

Definition of Soil Factors

The important characteristics that can be learned from the study of a vertical cross section of a soil include physical properties such as the amount of moisture that the soil will hold for plants, the rate at which

air and water move through the surface and subsoil, and the amount of soil that has been lost by erosion. From these factors then, it is possible to determine a best management system to be used on this particular kind of soil.

SURFACE TEXTURE

The texture of a soil influences its water holding capacity, the ease with which it may be worked, and its ability to furnish nutrients to plants. Texture refers to the proportion of sand, silt, and clay particles that make up the soil mass.

Sand, silt, and clay particles have been defined as having the following diameters: above 2 mm. (millimeters) is considered gravel and above 3 inches are considered stones; sand, between 2 mm. and 0.05 mm.; silt, between 0.05 mm. and 0.002 mm.; clay, less than 0.002 mm. An estimate of the texture of a soil in the

field is made from feeling when pressing and rubbing moistened soil between the thumb and finger. **Sand** grains feel gritty and can for the most part be seen with unaided eye. **Silt** produces a floury feeling when moistened and **clay** in turn is sticky and can be ribboned one-half inch or longer and will take a polish when pressed between the thumb and forefinger. The principal texture classes in the order of the increasing content of silt and clay are as follows: sand, loamy sand, sandy loam, loam, silt loam, clay loam, and clay. Variations within the clay and clay loam classes are indicated as sandy clay, silty clay, sandy clay loam, and silty clay loam. If a soil contains more than 52% sand by weight it falls into one of the sand groupings and it must have above 27% clay in order to fall in one of the clay classes. The loams would fall in between these ranges.

● **Coarse Textured Soils**

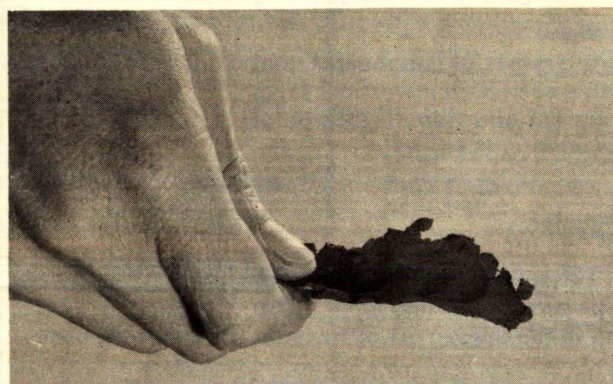
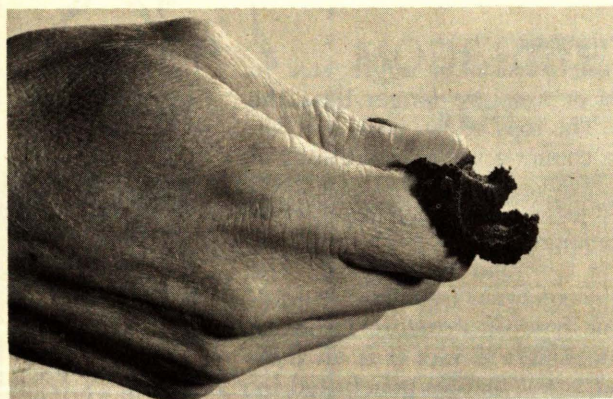
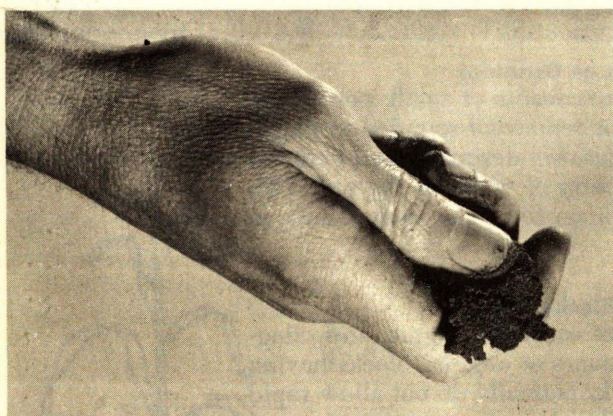
These soils are primarily sandy or gravelly and contain above 52% sand by weight. They feel gritty when rubbed between the fingers and will not "ribbon" or "leaf" when pressed. The soils take water in rapidly but lose it rather fast and for this reason they are often quite droughty. They are usually low in essential plant nutrients. Sandy soils are generally very susceptible to erosion if left unprotected. **A limiting factor.**

● **Medium Textured Soils**

These soils contain a favorable mixture of sand, silt, and clay particles which makes it neither too coarse or too fine. It has a floury and somewhat gritty feeling when moistened and rubbed between the thumb and finger. It can be "leafed" or "ribboned" into short lengths of usually no more than one-half inch and may take a slight polish when pressed between the fingers. These soils are able to take in water at a moderate rate and are able to hold considerable water along with adequate air. They are also quite easily worked and have a good capacity to supply nutrients to plants. Soil plant relationships are generally good on these soils when drainage is no problem. **Not a limiting factor.**

● **Fine Textured Soils**

These soils contain a large proportion of clay particles which may impart some unfavorable characteristics. The soils tend to be sticky and plastic when wet and should be worked only when moisture conditions are just right. They can be "ribboned" into lengths longer than one-half inch easily and when pressed between the thumb and finger it will "leaf" readily and take on a high polish. These soils have a slow rate of water intake and proper aeration is a problem. Fine textured soils do have advantages however, in that they have a much higher water holding capacity, and are able to hold and furnish more plant nutrients than moderate or coarse textured soils. **A limiting factor.**



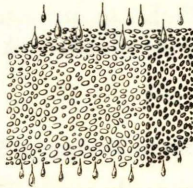
MOVEMENT OF AIR AND WATER IN SUBSOIL (PERMEABILITY)

Permeability refers to the capacity of the soil to permit air and water movement through the surface and the subsoil. Proper water-air relationships are necessary for favorable root development and normal plant growth. The physical properties of texture and structure largely influence the rate of movement of air and water through the soil. Soil structure refers to the arrangement of the soil particles. The individual grains

are held together in aggregates of different sizes and shapes although soils do occur in which there is no apparent structure. The size, shape, and stability of these aggregates have a marked influence on the productivity of the soil. They offer clues to the permeability of the soil. It is important to remember however, that the structure of the soil can be modified by tillage whereas texture cannot. Listed below are the principal types of structure and soil conditions commonly found in South Dakota soils.

PERMEABILITY

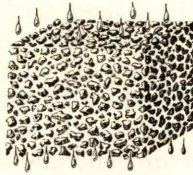
RAPID



Single Grain

This represents a soil condition consisting of primarily sand sized particles which tend to remain separated. This type of condition is common in the more coarse textured soils.

RAPID



Crumb or Granular

This type of structure consists of small, porous aggregates which tend to be somewhat rounded in shape. Granular aggregates form very desirable seed beds for crops and allow rapid entry of water in the soil. This type of structure is common for many surface soils in South Dakota.

MODERATE



Blocky

This type of structure consists of aggregates clinging together in nearly square or angular blocks having sharp edges. Large blocks normally do not allow rapid entry of water in the soil.

MODERATE



Prismatic

This type of structure consists of aggregates in which the vertical faces or axes are longer than the horizontal faces or axes. The tops of the units are flat. This type of structure is common under conditions of moderate permeability.

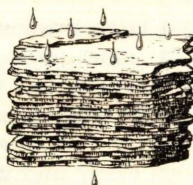
SLOW



Columnar

This type of structure is similar to prismatic. The main difference is that the columnar units have rounded biscuit like tops. This type of structure indicates conditions of slow permeability; in fact it is an indication of a soil layer that is not readily penetrated by plant roots.

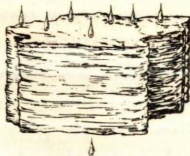
SLOW



Platy

This type of structure consists of aggregates that have longer horizontal faces or axes than vertical faces or axes. The fragments are flat and thin. This type of structure is usually associated with an underlying impermeable layer.

SLOW



Massive

This represents a soil condition where there is no evidence of aggregation. The soil particles tend to stick together in no definite pattern or arrangement. This condition is usually found in the lower part of the subsoil and in wet spots.

In addition to structure and texture, the color of the subsoil is a very important characteristic of permeability. Bright tan and brown colors are indications that the soil is well drained. If the subsoil contains orange, red, or gray spots the soil may be somewhat poorly drained. If the subsoil is almost entirely gray it indicates slow drainage.

● **Slow Permeability**

The rate of water and air movement in these soils is extremely slow and they may remain wet for long periods of time. Generally fine textured or compact subsoils are present. Evidence of a massive soil condition or columnar and platy structures may be present. The colors of the subsoil may be dull gray or gray along with flecks of orange and red. A **limiting factor**.

● **Moderate Permeability**

This represents a favorable condition for air and water movement in the soil. The colors of the surface

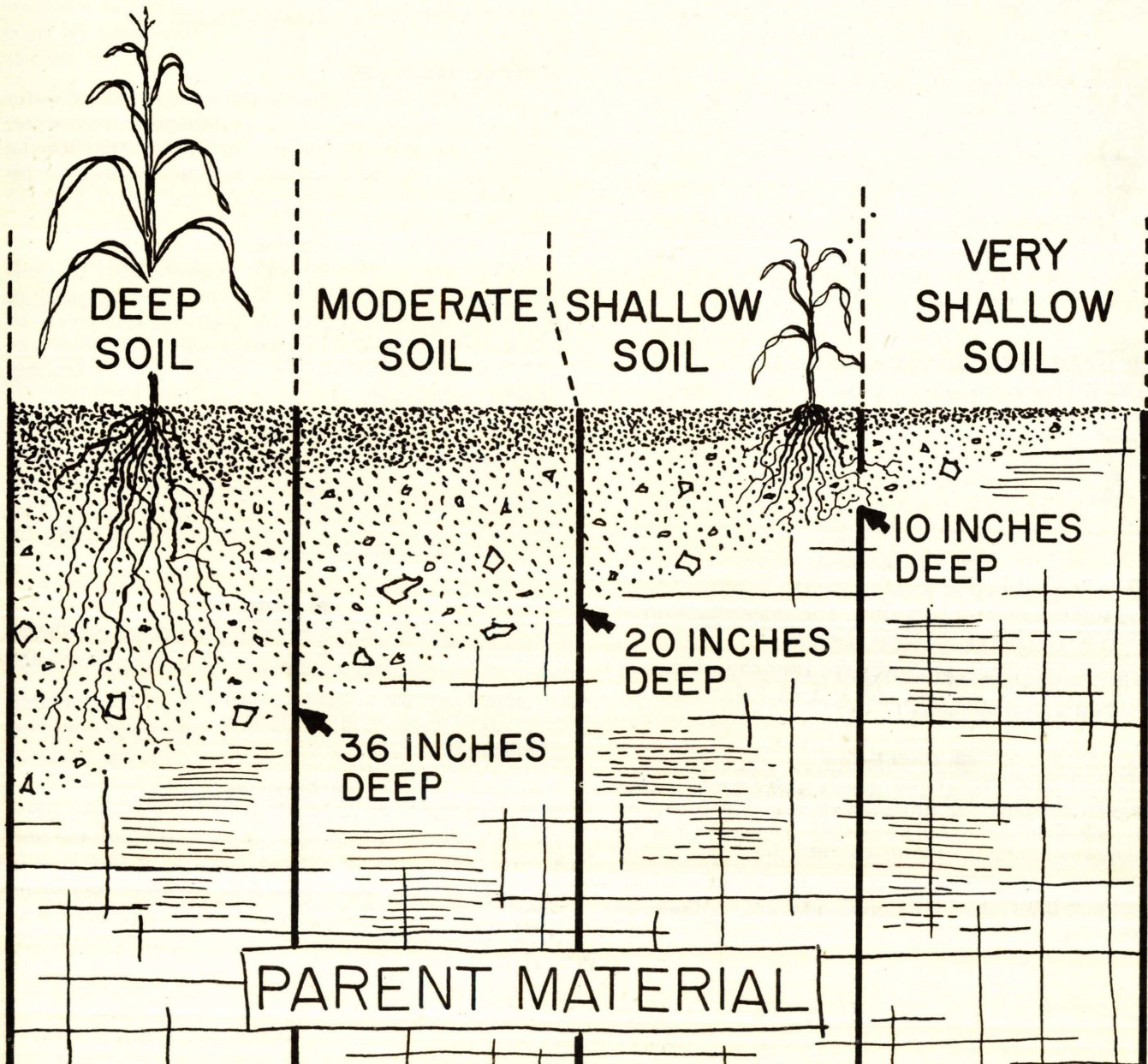
and subsoils are bright and uniform with no evidence of mottling. The texture of the subsoil is usually in the medium range although a somewhat finer textured condition may exist. The structure of the subsoil is generally prismatic. **Not a limiting factor**.

● **Rapid Permeability**

Water and air move through these soils at a faster rate than desirable. As a result these soils tend to be droughty even under conditions of average rainfall. The colors of the subsoil are generally bright, uniform, and brownish. Usually the subsoils are coarse textured and a single grain soil condition exists. A **limiting factor**.

DEPTH FAVORABLE FOR PLANT ROOTS

This refers to the total depth of soil readily penetrated by plant roots. The thickness of the soil available for plant root growth is important in planning a management system. The roots of most plants will pene-



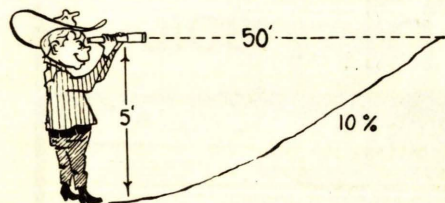
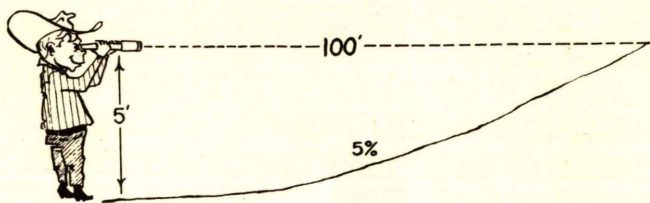
trate 3 feet or more under normal conditions if no obstructions exist. Soils of less thickness than this restrict root growth since they may lack storage capacity for water and plant nutrients. Examples of materials of soil layers not penetrated by plant roots are very loose coarse sand, gravel, cobble, clay or silt pans, sandstone, shale bedrock, and rock washed from shale. Classification as to depth favorable for plant root growth is determined by measurement of the distance from the surface of the soil to the limiting layer as follows:

- **Deep**—Soil 36 inches or more deep
- **Moderate**—Soil 20 to less than 36 inches deep
- **Shallow**—Soil 10 to less than 20 inches deep
- **Very Shallow**—Soil less than 10 inches deep

Any depth less than 36 inches deep becomes a limiting factor.

SLOPE

Slope refers to the number of feet fall in each 100 feet of horizontal distance. Slope is important because of its effect on water runoff and hence the washing of soil. It also affects the use of machinery on the land. Slope is a very important physical feature in determining the land capability class of the soil.



● **Nearly Level**

This is land that is level or nearly level on which water runoff is slow or very slow. The slope alone offers no difficulty in the use of farm machinery.

Water erosion is generally no problem. There is less than 3 feet of fall per 100 feet of horizontal distance. **Not a limiting factor.**

● **Undulating**

This is land that slopes gently and has no sharp breaks in steepness or direction of slope. Water runoff is slow or medium for most soils. All types of farm machinery may be used without difficulty as far as the slope is concerned. There is from 3 to less than 6 feet of fall per 100 feet of horizontal distance. **A limiting factor.**

● **Sloping**

This represents considerable slope and there may be some sharp changes in steepness or direction of slope. Water runoff is medium to rapid for most soils. Practically all types of farm machinery can be used without too much difficulty in so far as slope is concerned. There is from 6 to less than 10 feet of fall per 100 feet or horizontal distance. **A limiting factor.**

● **Rolling**

This is strongly sloping or hilly land on which water runoff is rapid or very rapid on most soils. Unless the slopes are very short and irregular, most farm machinery can be used, but with difficulty, especially for the heavier types. The slope ranges from 10 to less than 20 feet of drop per 100 feet of horizontal distance. **A limiting factor.**

● **Steep**

This represents a steeply sloping or very hilly soil area on which water runoff is very rapid on most soils. Only the lightest types of farm machinery can be used; in most cases however, this becomes impractical altogether. There is 20 feet or more drop per 100 feet of horizontal distance. **A limiting factor.**

SURFACE DRAINAGE

Surface drainage refers to the relative rate of water removal from the soil. It is the relative rate of water removal that is in excess of the amount that can be absorbed by the soil. Hence, surface drainage is affected both by permeability and slope.

● **Poor**

Water moves off these soils so slowly that the soils remain wet a large part of the time. A large part of the water received passes through the soil layers or evaporates in the air. Soils with a slow rate of surface runoff are either level or very nearly level. **A limiting factor.**

● **Fair**

Water runoff is at such a rate that a moderate amount of the water received enters the soil and free water lies on the surface for only short periods of time. Only a small amount of the water received is lost by surface runoff. **A limiting factor.**

● **Good**

This represents a condition of normal drainage. Surplus water is no problem on these soils. Water lost from the surface by runoff does not reduce seriously the supply available for plant growth. A considerable proportion of the water received enters the soil. **Not a limiting factor.**

● **Excessive**

A large proportion of the water received on these soils moves rapidly over the surface or through the soil. Surface water may be removed nearly as fast as it is added. Soils with excessive surface drainage conditions usually have considerable slope or may be coarse textured. **A limiting factor.**

EROSION—WIND AND WATER

Erosion refers to the wearing away of the soil by the forces of water and wind. The amount of top soil lost through erosion is very important in determining how the soil should be used. Man, through his methods of using the land, is largely responsible for the soil losses that have occurred. Soils vary in their susceptibility to erosion.

Factors such as slope, organic matter content of the soil, crops grown, and other forms of soil management have an important effect on the erodability of the soil and the amount of soil that has been lost.

The classes listed below are based on the amount of soil that has been lost in the past by erosion.

● None to Slight

Less than 25% of the original surface soil has been removed by wind or water or by both. There is no evidence of gullies. **Not a limiting factor.**

● Moderate

There has been from 25 to less than 75% of the original surface soil removed by erosion. There may or may not be gullies present including some of which may be uncrossable by farm machinery. **A limiting factor.**

● Severe

Seventy-five percent or more of the original surface soil has been lost. There may be occasional uncrossable gullies and/or severe accumulation of soil by wind. **A limiting factor.**

STONINESS

Stoniness refers to the relative proportion of stones over 10 inches in diameter in or on the soil. Stones have an important bearing on soil use because of their interference with the use of agricultural machinery. Stones also have another adverse effect in that they decrease the amount of soil for a given volume since they take up space which ordinarily would be occupied by soil. This may be especially important in instances of thin soils. Classes of stoniness are outlined as follows:

● None

No stones or too few to interfere with tillage. **Not a limiting factor.**

● Slight

Sufficient stones to interfere with tillage but not to make intertilled crops impractical. About 0.15 to 1.5 cubic yards per acre-foot. (If stones are 1 foot in diameter and about 30 to 100 feet apart there are about 0.15 to 1.5 cubic yards per acre-foot). **A limiting factor.**

● Moderate

Sufficient stones to make tillage of intertilled crops impracticable. About 1.5 to 50 cubic yards per acre

foot. (If stones are 1 foot in diameter and about 5 to 30 feet apart, there are about 1.5 to 50 cubic yards per acre-foot). **A limiting factor.**

● Excessive

Sufficient stones to make all use of machinery impracticable. There are over 50 cubic yards of stones per acre foot. (If stones are 1 foot in diameter and 5 feet or less apart there are about 50 or more cubic yards per acre-foot.) **A limiting factor.**

DEFINITIONS OF SOIL MANAGEMENT PRACTICES

Vegetative Practices:

1. **Use legumes and/or grass one half of the time in the rotation.** A rotation system of soil conserving and improving crops grown on the field one-half of the time such as 1 year in 2, 2 years in 4, etc. This practice is normally used on Class IV lands.

2. **Use legumes and/or grass one third of the time in the rotation.** A system of soil improving and conserving crops grown on the field one-third of the time such as 1 year in 3, 2 years in 6, etc. This practice is normally used on Class III lands.

3. **Use legumes and/or grass one-fourth of the time in the rotation.** A system of soil conserving and improving crops grown one-fourth of the time such as 1 year in 4, 2 years in 8, etc. This practice is normally used in Class I and II lands.

4. **Plow under crop residue.** This practice of complete turn under of crop residues is used on nearly level land that is not subject to erosion.

5. **Incorporate crop residue with the soil surface.** This practice of handling residues so that part of the material is mixed with the soil and part left on the surface. Used for lands in the lower rainfall areas and on lands subject to some erosion. Use on Class II, III and IV land.

6. **Leave crop residue on the surface soil.** This practice provides for a protective cover by leaving crop residues of any previous crop as a mulch on the surface. Use on Class III lands having a coarse or fine texture limitation.

7. **Establish tree belts.** Planting of recommended trees in belts to reduce wind erosion.

8. **Establish recommended grasses and/or legumes.** This practice is used on land not suitable for cropping because of erodability, wetness, alkali, stoniness, or low fertility. This practice is used on Class V, VI, and VII lands.

9. Control Grazing. This is a practice of carrying out a system of grazing that will maintain or improve desirable vegetation on pasture and range; deferred grazing, rotation grazing, and proper stocking are some of the practices included. Use on Class V, VI, VII lands.

10. Renovate and seed recommended mixtures. To kill out old sod and through cultivation, fertilize, and reseed to recommended mixtures. Use on Class V, VI, and VII lands when instructed to pay attention to the existing practices on the field.

Mechanical and Supporting Practices for Erosion Control

13. Diversion terrace. A channel with a supporting ridge on the lower side. It is built across the slope on a gentle grade. A diversion terrace intercepts water from the slope above and carries the water off to a safe outlet. Use with lands when overhead water is a problem.

14. Use wind strip cropping. The use of alternate strips of grain crops approximately same width. The system should be nearly at right angle to the prevailing winds. Use on coarse and fine textured surface soils subject to wind erosion.

15. Farm on the contour. Perform field operations such as plowing, planting and cultivation on the contour or at right angles to the slope. Use on lands of 3 to 6% slope.

16. Terrace and farm on contour. A channel and ridge of earth constructed across the slope approximately on the contour to intercept runoff and reduce erosion. Terraced land should be farmed parallel to the terrace. Use on tilled lands of 6% or more slope, unless soil is coarse texture.

17. Install drainage system. To remove excess surface or ground water from land by means of open ditches or tile drains.

Fertilizer and Soil Amendments

19-24. Use Field Condition Information and Soil Analysis as a basis for fertilizer and soil amendment recommendations.

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DEFINITIONS OF LAND CAPABILITY CLASSES

Major Land-Use Suitability

SUITED FOR CULTIVATION

Land Capability Class

I—Very good land; few or no limitations; can be cultivated safely with ordinary good farming practices. There are no serious climatic hazards.

II—Good land; moderate limitations or hazards due to land characteristic or climatic environment; can be cultivated safely with moderately intensive treatments.

III—Moderately good land; severe limitations or hazards due to permanent land characteristics; can be cultivated safely with intensive treatments.

IV—Fairly good land; very severe limitations or hazards.

Major Land-Use Suitability

**NOT SUITED FOR CULTIVATION
SUITED FOR GRAZING**

Land Capability Class

V—Good hay or pasture land, but too wet for cultivation. Normally bottomland soils with high water tables or subject to frequent flooding.

VI—Growth or utilization of vegetation moderately limited by steep land characteristics or shallow restrictive claypan; generally good to moderately good grazing lands.

VII—Growth or utilization of vegetation severely limited by extremely steep land characteristics, incoherent sandy soils or very salty lowland; generally fair to poor grazing land.

**NOT SUITED FOR CULTIVATION
GRAZING OR FORESTRY**

VIII—Suited for wildlife, recreation, or watershed protection. Consists of marshlands, badlands, and saline barren lands.

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