SOILS JUDGING CONTEST
2 YEAR DIVISION
OFFICIAL RULES REGULATIONS
AND INFORMATION
2008
CONTEST RULES - TWO YEAR DIVISION

SCORE CARD INSTRUCTIONS

The score card consists of three parts: I. Soil Morphology; II. Site and Soil Characteristics; and III. Interpretations. The Soil Survey Manual (Chapter 3, October 1993) and Keys to Soil Taxonomy, 8th ed., 1998 will be used as guides. Any significant deviations from these references will be noted in these instructions.

I. SOIL MORPHOLOGY: In each pit, you will be asked to evaluate up to five layers, and describe them using standard terminology. The number of layers to be judged will be on a card at each pit. The depth of the substratum will be given on the site card. If the layer is a Cr or R horizon, enter the depth, but do not describe anything else. Morphological features need not be recorded for Cr or R horizons. If they are, graders will ignore them and no points will be deducted. For each layer, evaluate layer depth, boundary distinctness, texture, coarse fragments, color, structure, moist consistency, and accumulations. Be sure to write clearly. Then, based on your understanding of soils, your description, and these instructions, complete the back side of the score card (Parts II and III). A complete list of acceptable abbreviations are in these instructions.

1. DEPTH: (see SSM 3-134-135) Horizon depths often cause problems. In order for the students and judges to have a common base, we will use the following guidelines.

Up to five layers will be described within a specified depth. You should determine the depth in cm., from the soil surface to the lower boundary of each layer. Thus, for a layer that occurs 23-37 cm. below the surface, you should enter 37. The blank for the last layer=s lower boundary will not be graded, no matter what you put in it, since this information is given on the site card.

A blue flagged nail will be placed somewhere in the third layer. Depth measurements should be made in the control zone. The allowed range for answers will depend on the distinctness, and to a lesser degree, the topography of the boundary, as determined by the judges. The depth to the blue flagged nail will be listed on the site card.

Please note the following: If a lithic or paralithic contact (hard or soft bedrock) occurs anywhere in the exposed control zone (within 150 cm.) you will need to consider it in answering Part II Water Retention Difference, Effective Rooting Depth and Permeability, as well as in any rating charts used in Part III. This is true even if the contact is at, or below, the specified description depth, and not an actual layer in your profile description. If such a situation arises, assume your last layer=s properties extend to the contact. Be sure and note the contact depth, while you are in the pit, even if it is below the description depth. If the contact is within the specified description depth, it should be the substratum layer. Morphological features need not be recorded for Cr or R horizons. If they are, graders will ignore them and no points will be deducted.

B. DISTINCTNESS OF BOUNDARY: The distinctness of horizon boundaries is to be evaluated, as described on page 4-51 of Chapter 4. The distinctness of the lower boundary of the last layer is

not to be determined. The topography, or shape, of the boundaries will not be directly considered, but it could influence contest officials.

As a guide, the following system will relate lower depth and distinctness of boundary for full credit.

Distinctness Lower Depth Range
Abrupt = + - 1 cm.
Clear = + - 3 cm.
Gradual = + - 8 cm.
Diffuse = + - 15 cm.

This method of determining full credit may be modified on a given site, by contest officials.

C. COARSE FRAGMENTS: Coarse Fragment modifiers should be used, if a layer's coarse fragment content is > = 15% by volume. This modifier should be listed on the score card. Do not enter your numerical volume estimate. The following modifiers or abbreviations should be used:

% Volume Modifier Abbreviations
0 - 14.9% None C
15 - 34.9% Gravelly GR
35 - 59.9% Very Gravelly VGR
60% + Extremely Gravelly EGR

4. TEXTURE : Texture for each horizon should be designated as one of the 12 basic textural classes, listed in SMM 3-136-142. Textural class names may be written or abbreviated. The following are the correct abbreviations for textural classes (the abbreviations are on the scorecard):

S Sand CL Clay Loam
LS Loamy Sand SICL Silty Clay Loam
SL Sandy Loam SCL Sandy Clay Loam
L Loam SC Sandy Clay
SI Silt SIC Silty Clay
SIL Silt Loam C Clay

E. COLOR: (See SMM 3-146-157) Determine moist color for each layer. For surface horizons determine color on crushed samples. The color recorded for soil materials from any other horizon, including a mottled horizon, should be the dominant matrix color taken across a broken ped surface.

In this contest, four (4) color classes will be used, and are differentiated from each other on the basis of Munsell value and chroma. The color of soil layers is often closely related to such properties as drainage class, degree of oxidation or reduction and organic matter content. Color is also a major classification criteria for surface soil, mollic vs. ochric epipedons.

Hues commonly range from 2.5 YR to 5 Y, with hues of 7.5 YR to 2.5 Y being most typical. The following table lists the four (4) color classes and their limits:

COLOR HUE VALUE CHROMA
Dark any < = 3 and < = 3
Medium & Bright any 4 - 6 and 3 - 8
Medium & Dull any 4 - 6 and 0 - 2
Light any > = 7 and any

6. STRUCTURE: (See SMM 3-157-187) Record the dominant type (shape) of structure for each layer. Single grain and massive are terms for structureless soils, but they are included under shape. Single grain material has only loose mineral grains present and is basically non-cohesive. Massive material has no structural arrangement, but is coherent, and when the soil is broken out, it consists mainly of fragments and some mineral grains. If different types of

structure occur in different parts of the layer, give the type of the one that is prevalent. If a horizon has compound structure (i.e., prismatic parting to angular blocky), give the primary structure. The following is a list of structure types and their abbreviations:

Abbreviation	Structure
GR	Granular
PL	Platy
PR	Prismatic
CO	Columnar
ABK	Angular Blocky
SBK	Subangular Blocky
MA	Massive
SGR	Single Grain

7. MOIST CONSISTENCY: (see SSM 3-172-177) Soil strength at field moisture capacity (moist consistency) should be determined on samples from each layer. Moist consistency classes and abbreviations are as follows:

Loose L	Firm FI
Very Friable VFR	Very Firm VFI
Friable FR	Extremely Firm EFI

8. ACCUMULATIONS AND MOTTLES: (see SSM 3-166-172) Accumulations in the soil refers to concretions, nodules, or soft masses which are discrete localized concentrations of chemical compounds. Black, red, and white are the choices for accumulations.

Mottles (see SSM 3-154-157) For this contest, mottles will be considered as subdominant colors (high or low chroma) on ped interiors or surfaces that are the results of oxidation - reduction. The following features will not be considered as mottles; clay skins, skeletons (sand or silt coats), or other ped coatings, concretions, nodules, soft masses, krotovinas, rock fragment colors, roots, and mechanical mixtures of horizons such as B materials in the Ap. Mottles may be bright (chroma > = 3) or gray (chroma < = 2).

More than one answer is possible for this section in each layer. If a layer has red iron nodules and bright mottles, answer red only once. The score card choices are as follows:

None --- No accumulations or mottles.

Black B Iron - manganese or manganese nodules, concretions, or soft masses.

Red R Iron nodules, concretions, or soft masses - or - bright mottles (> = 3 chroma) resulting from oxidation.

Gray G Low chroma mottles (< = 2) resulting from reduction which consist of reduced iron and/or manganese (or zones depleted of these).

White W Carbonate nodules, concretions, or soft masses.

II. SITE AND SOIL CHARACTERISTICS

1. LOCAL LAND FORM: Select the local land form of the site from the choices on the score card. In a situation where two parent materials are present, the land form will be selected on the basis of the process that controls the shape of the landscape. In most cases, this will be the lower parent material. For example, if alluvium is underlain by residuum, which is exposed in the pit, then an upland land form should be used. Only one land form is to be identified at each site.

Select the one that best describes the situation. Dual or partial credit may be awarded.

Floodplain: land bordering an active stream, built up of sediment from overflow of a stream. Although flooding may or may not occur frequently, this landform is subject to inundation when the stream is at flood stage. Parent material is considered recent alluvium.

Stream terrace: a landform in a stream or river valley, below the upland and above the current floodplain, consisting of a nearly level surface and hillslope leading downward from that surface. Parent materials are considered old alluvium.

Upland: Erosional land forms, which are generally well above a stream valley and on which residuum is the lowest parent material in the soil profile.

2. PARENT MATERIAL: Mark the appropriate parent material from the list on the score card. Contestants must identify the parent material(s) with each profile. If more than one parent material is present, all should be recorded. However, at least 25 cm. of a parent material must be present to be recognized in the parent material section of the score card. Parent material, like soils, do not always lend themselves to easy classification, so thecontest officials may need to take the complexity of the situation into account in scoring alternative interpretations. The following are definitions of parent materials.

Recent Alluvium: unconsolidated sediments of Holocene age that were deposited by modern (present day) streams. Recent alluvium will be restricted to the floodplains of these streams. Stratification in recent alluvium may or may not be evident. Soil formation is limited to no more than some development of soil structure, and this is not always present.

Old Alluvium: parent material for stream terraces.

Residuum: the unconsolidated and partially weathered mineral materials accumulated by disintegration of bedrock. This material has been thought of as weathered in place although some interpretations would call for significant movement of materials prior to the onset of soil formation.

3. SLOPE: Stakes with red flagging will be located at each site indicating where slope is to be determined. The tops of the stakes may not be the same height. Each contestant should have his, or her, own hand level. The slope ranges and classes are listed on the score card.

Concave 10 - 14.9%
< 1% 15 - 20%
1 - 4.9% > 20%
5 - 9.9%

4. DEGREE OF EROSION: (see SSM 3-80-89) Degree of erosion for water will be judged according to the guidelines below:

Deposition: A surface accumulation less than 50 cm. of “recent” mineral material, on the original soil. It usually has a different texture and/or color, from that directly underneath it. If the “recent” deposit is 50 cm. thick, or greater, it is considered a new profile and none to slight should be checked.

None to Slight (class I): The plow layer exhibits characteristics of the A horizon, and has lost some, but less than 25% of the original A, and/or E horizons. If the soil has not been plowed you are to assume this class of erosion.

Moderate (class II): The plow exhibits characteristics of both the A and underlying horizons. It contains 25 to 75% of the original A and/or E horizons with the remainder being derived from underlying material.

Severe (class III): The plow layer has lost more than 75% of the original A and/or E horizon with the remainder being derived from underlying material. Some areas are smooth, but shallow gullies, or a few deep ones, are common on some soils.

Very Severe (class IV): The original A and/or E horizons have been completely lost so that the existing plow layer is composed entirely of underlying material. Some areas may be smooth, but most have an intricate pattern of gullies.

5. SURFACE RUNOFF: "Runoff is the water that flows away from the soil over the surface without infiltrating" (SSM 3-111-115). The rate and amount of runoff are determined by soil characteristics, management practices, climatic factors, vegetative cover, and topography. In this contest we will use six (6) runoff classes and we will consider the combined effects of surface texture and slope on runoff rate. For contest purposes, vegetation is irrelevant and you are to treat each site as if it were a plowed field. The following guidelines will be used:

Percent Slope	Sand & Loamy Sand	SL, SCL, CL, SICL, SIL, SI, L	Silty Clay, Sandy Clay, & Clay
Concave	Negligible	Negligible	Negligible
0 - < 1%	Negligible	Low	Medium
1 - < 5%	Very Low	Medium	High
5 - < 20%	Low	High	Very High
20% +	Medium	Very High	Very High

6. SOIL DRAINAGE CLASS: In this contest we will use four (4) classes by grouping excessively and somewhat excessively in with well drained, and very poorly into poorly drained. The four (4) classes will be defined in terms of color as shown:
   - Well The entire subsoil has uniform bright colors (such as brown, yellowish brown, or reddish brown), or lacks evidence of mottling.
   - Moderately Well The subsoil has uniform bright colors in the upper part and the lower part has dull gray mottling.
   - Somewhat Poorly The entire subsoil is mottled with gray.
   - Poorly The entire subsoil is dull gray.

7. EFFECTIVE SOIL DEPTH: (see SSM 2-26 & 3-134-145) For this contest effective soil depth is considered to be the depth of soil to a root limiting layer as defined in Soil Taxonomy (i.e., duripan, fragipan, petrocalcic, lithic, or paralithic contact). The various depth classes are listed on the score card.

H. & I. PERMEABILITY: (Hydraulic Conductivity) In this contest we will estimate the permeability of the surface horizon (H) and the most limiting horizon (I). As previously stated under Part I – "depth", you will need to consider a lithic or paralithic contact, regardless of whether or not it is within your specific judging depth. In this

contest, such a contact will be considered to have very slow permeability, and slow will have to be marked for “permeability/limiting”. We will also consider primarily texture, as it is the soil characteristic that exerts the greatest control on permeability. Structure will be a consideration for some layers with > 35% clay. Although the National Soils Handbook lists more, we will group very slow in with slow and moderately rapid in with rapid.

The three (3) general permeability classes will relate to texture as follows:

Class Inch/Hour Textures
Slow < 0.06-0.6 Clay, Sandy Clay, Silty Clay,
Silty Clay Loam, Clay Loam
Moderate 0.6 - 2.0 Silt, Loam, Silt Loam, Sandy Clay Loam,
and Very Fine Sandy Loam (VFSL)
Rapid 2.0 - >6.0 Sand, Loamy Sand,
all Sandy Loams except VFSL
Rate any Cr or R horizons as (slow). Rate any natric horizon as two (2) classes slower than texture indicates.

8. WATER RETENTION DIFFERENCE: (see SSM 6-292) Water retention difference refers to the amount of water, in cm., a soil is capable of holding within the upper 1.5 m., or above a lithic or paralithic contact, whichever is shallower. We will use the following four classes which are listed on the score card.

Very Low < 7.5 cm.
Low 7.5cm up to but not including 15.0 cm.
Moderate 15.0cm up to and including 22.5 cm.
High > 22.5 cm

Texture is an important factor influencing moisture retention and we will employ the following estimated relationships:

cm. water/cm. soil Textures
0.05 all Sands, Loamy coarse sands, Loamy sands
0.10 Loamy fine sands, Loamy very fine sands,
Coarse sandy loams
0.15 Sandy loams, Fine sandy loams, Sandy clay
loams, Sandy clays, Silty clays, Clays
0.20 Very fine sandy loams, Loams, Silt loams,
Silts, Silty clay loams, Clay loams

For a lithic or paralithic contact, you are to assume that no water retention occurs below the contact. If the contact is below the specified judging depth, but above 1.5 m., assume that your last horizon=s properties extend to the contact for your calculations. If a profile is not exposed to 1.5 m. and no lithic or paralithic contact is visible, assume your last horizon=s properties extend to 150 cm.
Coarse fragments are also considered to have negligible (assume zero) moisture retention and you will need to adjust your estimates accordingly (see example).

As example:
Surface (A) 0 - 27 cm. L 5% rock fragments
Subsoil (B) 27 - 99 cm. SIC
Substratum (BC) 99 - 140 cm. SICL
Cr 140 + weathered mudstone
Water Retention Calculations:
Surface (A) 27 cm. x 0.20 cm./cm. x .95* = 5.1 cm.
Subsoil (B) 72 cm. x 0.15 cm/cm = 10.1 cm.
Substratum (BC) 41 cm. x 0.20 cm/cm = 8.2 cm.
Cr 10cm. x 0.00 cm/cm = 0.0 cm.

High = 24.1 cm.

* correction for the volume of coarse fragments

PART III SOIL INTERPRETATIONS: Copies of the Land Capability Class Key, and the rating charts will be available for contestants at each site.

9. LAND CAPABILITY CLASS: For a general discussion of the Land Capability system refer to Agriculture Handbook 210.

Guidelines for interpretations for Roadfill, Septic Tank Absorption Fields, and Sewage Lagoons are taken from Part 620 of the revised National Soils Handbook (see attachment 2). In the contest you will be supplied with the rating tables, but not the written material. Therefore, you need to know how to use the tables, not memorize them.

Where depths are critical, they are taken from the control zone. The soil properties and their restrictive features are listed in descending order of importance on the table. On the score card, check the most severe limitation, or worst suitability, and list the most restrictive feature that gives the soil that rating (i.e., the one that is closer to the top of the table). Exception: When a soil has only slight or good ratings on the table, check slight or good, and list “none” for the restrictive feature. When two (2) or more properties give a soil the same rating (i.e., moderate - flooding and moderate - wetness), list as the restrictive feature the one closest to the top of the table. A severe or poor rating always takes precedence over a moderate, or fair rating.

Engineering test data will not be available. You will need to rely on your judgment to evaluate certain properties.

Properties on the tables relating to the AASHTO class, or the group index, and Unified class will not be used in this contest.

To aid your understanding of shrink-swell, permeability and gypsum, see the appropriate pages from Part 620 of the revised National Soils Handbook.

Example rating soil “X” for septic tank absorption fields:

The soil is a moderately deep, moderately well drained, slowly permeable soil, which is believed to have a seasonal high water table at about 50 inches (127 cm.). Slope is 2% and the soil is on a stream terrace and has no flooding hazard. The scorecard answer for limitation would be “severe”, and “percs slowly” would be the restrictive feature listed. Notice there are two (2) moderate limitations, “depth to rock” and “wetness”, but since there is a severe limitation, it takes precedence over the moderate limitations. If the soil had been shallow, instead of moderately deep, “severe-depth to rock” would be the correct answer.

Note: The depth column refers to the effective soil depth. Also, permeability for the capability class refers to the most limiting soil layers, and not Cr or R horizons.