TEXAS TECH UNIVERSITY
College of Agricultural Sciences & Natural Resources
Department of Animal and Food Sciences

NACTA 2013
Soils Judging-2 Year Division

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Rules:

1.Each team will consist of four (4) members judging (4) sites. One alternate may accompany the team and compete for individual awards only. The top three (3) scores per site will be used to tabulate team scores.
2.A tiebreaker system for individuals will involve estimates of the percent sand and clay for the surface horizon. Ties will be broken using the estimates in the order of clay then sand. Individual total score ties will be broken by using site scores in pit order (i.e. pit 1, then pit 2, etc.) Tabulating all four (4) members' cumulative scores will break team ties.
3.Fifty minutes will be allowed for judging each site - divided between time in, time out, and free for all time. (10 minutes in, 10 minutes out, 10 minutes in, 10 minutes out, 10 minutes free.)
4.Contestants may use a clipboard, hand level, containers for soil samples, pencil (no ink pens), knife, water and acid bottles, Munsell color book (Hue 1OR to Hue 5Y, Gley 1 & 2), and ruler or tape (metric preferred since all depths will be in cm.). A textural triangle may be used to assist contestants in completing the percent sand, silt and clay tiebreaker. Triangles will be supplied at the contest. One is enclosed for your use prior to the contest in Attachment 3. A 2 mm sieve for estimating coarse fragments may be used. Rating charts, but not their written explanations, for use in the interpretations section of the scorecard will be supplied at each site. One is enclosed for your use prior to the contest as Attachment 2. You do not have to memorize the charts, but should know how to use them.
5.In each pit, a control zone will be clearly marked and is to be used only for the measurement of horizon/layer depths boundaries. This area will be the officially scored profile and must not be disturbed. The profile depth to be considered, number of layers to be described, and any other relevant data, such as flood occurrence per 100 years, will be provided at each site. A red marker will be placed somewhere in the third layer to assist contestants in keeping in line with the official description. The depth in centimeters from the surface to the red marker will be given on the site card.
6.Stakes with red flagging will be set near each site for slope measurement. Slopes will be measured between the stakes that are set at approximately the same height.
7.Contestants will not be allowed to communicate with other contestants or coaches during the contest. No cell phones.
8.Pit monitors will be present to enforce rules and keep time. The official judge for the contest will be a NRCS soil scientist.
9.Each contestant must give his or her score card to the pit monitor before moving to the next site. Write your name, contestant number, college, and site number on each card. Use abbreviations for all columns except depth.

SCORE CARD INSTRUCTIONS

The score card consists of three parts: I. Soil Morphology; II. Site and Soil Characteristics; and III. Interpretations. The National Soil Survey Handbook, Soil Survey Manual (Chapter 3, October 1993), The Field Book for Describing and Sampling Soils, 2002, and Keys to Soil Taxonomy, 11th ed., 2010 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. 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 is in these instructions.

1. **LAYER/HORIZON**: (See SSM 3-117-122) Students should label each layer with the abbreviation for one mineral genetic horizon/layer (A, B, C, E, or R). If a horizon is a transitional horizon (e.g. AB, BA) or a combination horizon (e.g. A/B, B/A), students should record the genetic horizon whose properties dominate the layer (e.g. an AB or A/B would be A, a BA or B/A would be B). Official judges may decide to allow more than one correct answer for such horizons.

- A Horizon – Horizon formed at the surface that exhibits either an accumulation of humified organic matter, or properties resulting from cultivation or pasturing.
- E Horizon – Horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these, leaving a concentration of sand and silt particles.
- B Horizon – Horizon formed below an A or E, that shows one or more of the following: illuvial concentration of silicate clay, iron, aluminum, humus, carbonates, gypsum, or silica; evidence of removal of carbonates; residual concentration of sesquioxides; coatings of sesquioxides; alteration that forms silicate clay or liberates oxides and forms granular, blocky, or prismatic structure; or brittleness.
- C Horizon/Layer – Horizons/Layers, excluding hard bedrock, that are little affected by pedogenesis and lack properties of A, B, or E horizons
- R Layer – Hard bedrock. The layer is sufficiently coherent when moist to make hand digging with a spade impractical.

2. **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. To receive credit for the last layer's lower boundary, students are to write down the lower depth given on the site card.

A red marker 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 red marker 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: #7, Effective Rooting Depth, #8 and 9, Permeability and #10, Water Retention Difference, and, 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.

3. **DISTINCTNESS OF BOUNDARY**: The distinctness of horizon boundaries is to be evaluated as described in SSM 3-133. The distinctness of the lower boundary of the last layer is not to be determined and the contestant is to mark none (-) as the boundary distinctness to receive credit. 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 distinctness of boundary for full credit.

Distinctness	Abbreviation	Lower Depth Range
Abrupt	A	+/- 1 cm.
Clear	C	+/- 3 cm.
Gradual	G	+/- 8 cm.
Diffuse	D	+/- 15 cm.

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

4. **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

5. **COLOR**: (See SMM 3-146-154) 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 criterion for surface soil, such as mollic vs. ochric epipedons. Hues commonly range from 2.5YR to 5Y, with hues of 7.5YR to 2.5Y being most typical. The following table lists the four (4) color classes and their limits:

COLOR	ABBREVIATION	HUE	VALUE	CHROMA
Dark	D	any	< = 3	< = 3
Medium & Bright	MB	All colors not defined as D, MB, or L		
Medium & Dull	MD	any	4 - 6	0 - 2
Light	L	any	> = 7	any

6. **ACCUMULATIONS AND MOTTLES**: (see SSM 3-169-172) Accumulations in the soil refer to concretions, nodules, or soft masses which are discrete localized concentrations of chemical compounds. Concentrations 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, skeletans (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 concentrations (chroma > 2) or depletions (chroma 2 or less).

More than one answer is possible in each layer. If a layer has red iron nodules and bright mottles, answer concentrations only once. All applicable colors must be listed to receive credit. The score card choices are as follows:

Color	Abbreviation	Description
None	-	No accumulations or mottles.
Concentrations	C	Iron, iron-manganese, or manganese nodules, concretions, soft masses, or bright mottles (>2 chroma) resulting from oxidation (This includes mottles formerly identified as “Black” and “Red”).
Depletions	D	Low chroma mottles (2 or less) resulting from reduction which consist of reduced iron and/or manganese (or zones depleted of these).
White	W	Carbonate nodules, concretions, or soft masses.

7. **COARSE FRAGMENTS**: (see SSM 3-141-144) 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 abbreviations should be used:

% Volume	Modifier	Abbreviation
0 - <15%	None	-
15 - <35%	Gravelly	GR
35 - <60%	Very Gravelly	VGR
60% +	Extremely Gravelly	EGR

8. **TEXTURE**: Texture for each horizon should be designated as one of the 12 basic textural classes, listed in SMM 3-136-140. Textural class names are to be 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

9. **STRUCTURE**: (See SMM 3-157-163) 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

II. **SITE AND SOIL CHARACTERISTICS**

1. **PARENT MATERIAL**: **(May be modified by Host Institution)** 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**;** dual and/or partial credit may be awarded. 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 materials, like soils, do not always lend themselves to easy classification, so the contest officials may need to take the complexity of the situation into account in scoring alternative interpretations. The following are definitions of parent materials.

    Alluvium: sediment deposited by running water. It may occur on terraces well above present streams or in the normally flooded bottom land of existing streams. Remnants of very old stream terraces may be found in dissected country far from any present stream. Along many old established streams lie a whole series of alluvial deposits in terraces – young deposits in the immediate flood plain, up step by step to the very old deposits on the highest terraces. In some places recent alluvium covers older terraces (See SSM 3-76). Alluvium may occur as floodplains or stream terraces.

    Glacial outwash: a type of Pleistocene age fluvial deposit characteristic of heavily loaded streams with highly variable discharge that were fed by glacial melt waters. Glacial outwash is stratified and may be highly variable in texture. Glacial outwash has been in place long enough for development of a soil profile. Strata containing sand (medium sand or coarser) and/or gravel often are present. This feature distinguishes glacial outwash from lacustrine deposits. Glacial outwash may occur as outwash plains, stream terraces, kames, eskers, or as a relatively coarse material separating loess from till.

    Lacustrine deposit: relatively fine-textured (finer than medium sand), well-sorted, materials often stratified at depth, deposited in lake or slack water environments.

    Loess: fine-grained, wind-deposited materials that are dominantly of silt size. Textures are usually loam, silt loam, silt, or silty clay loam. Where loess mantles are thin (<75 cm), there may be some larger mineral particles particularly toward the base of the loess deposit. Larger particles can be incorporated into the loess through plant or animal activity or through colluvial action.

    Eolian sand: primarily fine and medium sand that has accumulated through wind action, normally on dune topography.

    Beach deposit: sandy material deposited near the shore of a lake, primarily by wave action.

    Glacial till: relatively compact, unsorted, unstratified Pleistocene-aged material, ranging in size from boulders to clay, deposited directly by ice without significant reworking by melt water. Glacial till can be found with almost any texture.

Colluvium: poorly sorted, Holocene-aged material accumulated on and, especially, at the base of hillslopes. Colluvium results from the combined forces of gravity and water in the local movement and deposition of materials. According to the *Soil Survey Manual* (p. 79), "Colluvium is poorly sorted debris that has accumulated at the base of slopes, in depressions, or along small streams through gravity, soil creep, and local wash." Material deposited locally in the form of alluvial fans will also be considered colluvium. Colluvium can occur on nearly any landform.

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.

2. **LOCAL LAND FORM**: **(May be modified by Host Institution)** 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 credit may be awarded by the contest officials.

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 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. Terrace materials were usually deposited by glacial melt water. Parent materials may include alluvium, glacial outwash, and lacustrine deposit.

Kame/esker: a conical hill (kame) or a sinuous ridge (esker) composed of stratified sand and gravel deposited by melt waters in contact with glacial ice. Parent material is glacial outwash.

Alluvial fan: a low, cone-shaped deposit formed by material deposited from a tributary stream of steep gradient flowing into an area with less gradient. This includes colluvial and alluvial footslopes. Parent material is colluvium.

Beach ridge: an essentially continuous ridge of sandy material along the present or former shoreline of a lake. Parent material is beach deposit.

Loess plain/hillslope: landforms consisting of windblown silt deposits that are thick enough for an entire solum to develop in loess. Parent material is loess.

Outwash plain: a low-relief area, when considered regionally, composed of glacio-fluvial debris spread away from glacier margins by melt waters that were not confined to a river valley. The topography of a pitted outwash plain can be very irregular. At least one parent material is glacial outwash.

Sand dune: a hill or ridge of wind-blown sand. Parent material is eolian sand.

Lake plain: a level landform located on the bed of a former lake or pond and underlain by stratified lacustrine sediments. Parent material is lacustrine deposit.

Till plain/drumlin/moraine: an extensive, flat to undulating area underlain by glacial till. For our purposes till plains are considered to include ground, recessional, end or terminal moraines, and drumlins. A till plain may be covered by loess, but it is still considered a till plain if the general shape of the landform is controlled by the till surface and soil development extends into the till or till is present within the depth described. Parent material is glacial till.

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

3. **SLOPE**: (see SSM 3-64-66) Stakes with 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 - <15%
< 1%	15 - <20%
1 - <5%	20% +
5 - <10%	

4. **DEGREE OF EROSION**: (see SSM 3-80-89) Degree of erosion by water will be judged according to the guidelines below. Students are to assume an original plow layer thickness of 20 cm unless otherwise directed by the contest officials.

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/E horizons. If the soil has not been plowed you are to assume this class of erosion.

Moderate (class II): The plow layer 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.

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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** (see SSM 3-113-115). 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:

Slope	**Surface Runoff -based on texture of the surface horizon**		
	S, LS	**SI, SIL, SICL, L, CL, SL, SCL**	**C, SIC, SC**
concave	negligible	negligible	negligible
< 1%	negligible	low	medium
1 - <5%	very low	medium	high
5 – <20%	low	high	very high
20% +	medium	very high	very high

6. **SOIL WETNESS CLASS**: In this contest, soil materials in the wet state (seasonal or permanent saturation with reducing conditions) are those that have redoximorphic features with gray (chroma 2 or less) matrix colors or gray mottles (depletions). The interpretation of wetness class is conservative because reducing conditions are seasonal and saturation may be closer to the soil surface than is indicated by the morphological features used to indicate wetness. Soils that have gray redoximorphic features (matrix or mottles) immediately below a dark colored A horizon should be assumed to be Class 5: wet above 25 cm.

If no evidence of wetness is present above a lithic or paralithic contact, assume Class 1: not wet above 150 cm. If no evidence of wetness exists within the specified depth for judging and that depth is less than 150 cm, assume Class 1: not wet above 150 cm.

The wetness classes utilized in this contest are those which define a "depth to the wet state."

Soil Wetness Class	Description
1	Not wet above 150 cm
2	Wet in some part between 100 and 150 cm
3	Wet in some part between 50 and 99 cm
4	Wet in some part between 25 and 49 cm
5	Wet above 25 cm

7. **EFFECTIVE SOIL DEPTH**: (see SSM 3-134-135) 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, dense glacial till, petrocalcic, lithic, or paralithic contact). If there are no limitations evident the soil will be classified as very deep. The various depth classes are listed on the score card.

8 & 9. **PERMEABILITY**: (Hydraulic Conductivity) In this contest we will estimate the permeability of the surface horizon (8) and the most limiting horizon (9). As previously stated under Part I – "Depth", you will need to consider a root limiting layer, regardless of whether or not it is within your specific judging depth. Such a contact will be considered to have very slow permeability, and slow will have to be marked for "permeability/limiting". We will consider primarily texture, as it is the soil characteristic that exerts the greatest control on permeability. Structure may be a consideration for some layers with > 35% clay.

The National Soils Handbook lists the following classes of permeability:

PERMEABILITY	INCH/HOUR	TEXTURES
Very Slow	0.00 – 0.42	R, Cr, Cd, Fragipan or Duripan Horizon
Slow	0.42 – 1.41	Sandy clay, Silty clay, or Clay
Moderately Slow	1.41 – 4.23	Silty clay loam, Clay loam, or Sandy clay loam
Moderate	4.23 – 14.11	Very fine sandy loam, loam, silt loam, or silt
Mod. Rapid	14.11 – 42.34	Sandy loam (except VF Sandy loam)
Rapid	42.34 – 141.14	Sand (except coarse sand), or Loamy sand
Very Rapid	> 141.14	Coarse Sand

Rate any natric horizon as two (2) classes slower than texture indicates.

For this contest we will group very slow in with slow, moderately slow and moderately rapid with moderate, and very rapid with rapid.

10. **WATER RETENTION DIFFERENCE**: (see SSM 6-292-293) 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 root limiting layer, 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 to< 15.0 cm.
Moderate	15.0cm to 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 root limiting layer, 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 root limiting layer is visible, assume your last layer's properties extend to 150 cm. Coarse fragments are considered to have negligible (assume zero) moisture retention and you will need to adjust your estimates accordingly (see example).

As an 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	=	10.8 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 for Roadfill, Septic Tank Absorption Fields, and Sewage Lagoons will be provided to contestants.

LAND CAPABILITY CLASS: For a general discussion of the Land Capability system refer to Agriculture Handbook 210 or the National Soil Survey Handbook (NSSH) section 622. Attachment 1 is a simplified version of the Land Capability Class Key used by NRCS and will be used for this contest. The table should be read across each row from the top down, until all features across match the soil description. A soil may meet the criteria for more than one land capability class; it will always be assigned to the highest possible class. **Note:** Permeability in Attachment 1 refers to the permeability of the most limiting soil layer, and not Cr or R horizons.

Subclasses are defined below and listed in order of importance (see NSSH section 622). Contestants should mark the single most important subclass appropriate. Land Capability Class (LCC) I has no subclasses and the contestant should mark "No subclass" for all LCC I sites.

Subclass e is made up of soils for which the susceptibility to erosion is the dominant problem or hazard affecting their use. Erosion susceptibility and past erosion damage are the major soil factors that affect soils in this subclass.

Subclass w is made up of soils for which excess water is the dominant hazard or limitation affecting their use. Poor soil drainage, wetness, a high water table, and overflow are the factors that affect soils in this subclass.

Subclass s is made up of soils that have soil limitations within the rooting zone, such as shallowness of the rooting zone, stones, low moisture-holding capacity, low fertility that is difficult to correct, and salinity or sodium content.

Subclass c is made up of soils for which the climate (the temperature or lack of moisture) is the major hazard or limitation affecting their use.

3, 4, & 5: Guidelines for interpretations of 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. Attachment 5 is provided to assist contestants in using the rating charts.

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.

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.

Sections 3, 4, & 5 of Part III are valued at 10 points each. Five points will be awarded for the correct rating and 5 points for the correct restrictive feature. The rating need not be correct to obtain points for the restrictive feature or vice versa.

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2013 NACTA SOILS JUDGING
2 YEAR DIVISION
SOILS JUDGING SCORECARD
Host: Texas Tech University – Lubbock, Texas

SITE NO. _______________ CONTESTANT I.D.__________________________

Describe soil to _____cm. Red marker in 3rd layer at______cm. TOTAL SCORE___

PART I

Layer / Horizon (2 pts.)	Lower Depth (cm) (2 pts.)	Boundary Distinctness (2 pts.)	Moist Consistency (2 pts.)	Color (2 pts.)	Accumulations or Mottles (2 pts.)	Coarse Fragments (2 pts.)	Texture (5 pts.)	Structure Shape (5 pts.)	Score
1.									
2.									
3.									
4.									
5.									
A B C E R	Record lower depth in cm	Abrupt (A) Clear (C) Gradual (G) Diffuse (D) None (-)	Loose (L) V. Friable (VFR) Friable (FR) Firm (FI) V. Firm (VFI) Ext. Firm (EFI)	Dark (D) Medium & Bright (MB) Medium & Dull (MD) Light (L)	None (-) Concentrations (C) Depletions (D) White (W)	None (-) Gravelly (GR) V. Gravelly (VGR) Extremely Gravelly (EGR)	S, LS, SL, L, SCL, SI, SIL, CL, C, SICL, SIC, SC	GR, PL, SBK, ABK, PR, CO, MA, SGR	

Use abbreviations for all columns except depth.

SCORE PART I ____________

Part II - SITE AND SOIL CHARACTERISTICS

A. PARENT MATERIAL (5 pts each correct)
_____ Alluvium
_____ Glacial outwash
_____ Glacial till
_____ Beach deposit
_____ Colluvium
_____ Loess
_____ Lacustrine
_____ Eolian sand
_____ Residuum

B. LOCAL LAND FORM (5)
_____ Flood plain
_____ Stream terrace
_____ Outwash plain
_____ Kame/esker
_____ Till plain/drumlin/moraine
_____ Beach ridge
_____ Alluvial fan
_____ Loess hillslope/plain
_____ Lake plain
_____ Sand dune
_____ Upland

C. SLOPE (5)
_____ Concave
_____ < 1%
_____ 1 - <5%
_____ 5 - <10%
_____ 10 - <15%
_____ 15 - 20%
_____ > 20%

D. SURFACE RUNOFF (5)
_____ Negligible
_____ Very Low
_____ Low
_____ Medium
_____ High
_____ Very High

E. DEGREE OF EROSION (5)
_____ Deposition
_____ None to Slight (class I)
_____ Moderate (class II)
_____ Severe (class III)
_____ Very Severe (class IV)

F. SOIL WETNESS CLASS (5)
_____ Not wet above 150 cm
_____ Wet between 100 to <150 cm
_____ Wet between 50 to <100 cm
_____ Wet between 25 to <50 cm)
_____ Wet above 25 cm

G. SOIL DEPTH (5)
_____ Very Shallow (< 25 cm.)
_____ Shallow (25 - <50 cm.)
_____ Moderately Deep (50 - <100 cm.)
_____ Deep (100 - 150 cm.)
_____ Very Deep (> 150 cm.)

8. PERMEABILITY/SURFACE (5)
_____ Slow
_____ Moderate
_____ Rapid

9. PERMEABILITY/LIMITING (5)
_____ Slow
_____ Moderate
_____ Rapid

10. WATER RETENTION DIFFERENCE (5)
_____ Very Low (<7.5 cm.)
_____ Low (7.5 - <15 cm.)
_____ Moderate (15 - 22.5 cm.)
_____ High (> 22.5 cm.)

Part III – INTERPRETATIONS

1. LAND CAPABILITY CLASS (5)
_____ Class I
_____ Class II
_____ Class III
_____ Class IV
_____ Class V
_____ Class VI
_____ Class VII

2. LAND CAPABILITY SUBCLASS (5)
_____ e - Subclass
_____ w - Subclass
_____ s - Subclass
_____ c - Subclass
_____ No Subclass

3. ROADFILL (5)
_____ Good
_____ Fair
_____ Poor
__________________________ Feature
(5)

4. SEPTIC TANK ABSORPTION FIELDS (5)
_____ Slight
_____ Moderate
_____ Severe
__________________________ Feature
(5)

5. SEWAGE LAGOONS (5)
_____ Slight
_____ Moderate
_____ Severe
__________________________ Feature
(5)

Tie Breaker (Surface)

% clay ___________

% sand ___________

SCORE PARTS II & III _______________

Attachment 1 - LAND CAPABILITY KEY

Depth (cm.)	Surface Texture	Slope	Erosion	Permeability/ Soil Layer*	LC Class
>50	all but sandy	NL: 0-1%	N	S to MR	I**
>50	all but sandy	NL: 0-1%	N	VS	II
	all but sandy	NL: 0-1%	M	S to MR	II
	all but sandy	GS: 1-3%	N	S to MR	II
>50	S or LS	NL: 0-1%	N to M	S to R	III
	S or LS	GS: 1-3%	N to M	S to R	III
	all but sandy	GS: 1-3%	N to M	VS	III
	all but sandy	GS: 1-3%	M	S to MR	III
	all but sandy	MS: 3-8%	N to M	S to MR	III
<50	S or LS	NL to GS: 0-3%	N	ANY	III
>50	S or LS	MS to SS: 3-12%	N to M	MR to R	IV
	all but sandy	NL: 0-1%	S to VS	S to MR	IV
	all but sandy	GS: 1-3%	M	VS	IV
	all but sandy	MS: 3-8%	N to M	VS	IV
	all but sandy	SS: 8-12 %	N to M	S to MR	IV
<50	all but sandy	NL: 0-1%	M	ANY	IV
	all but sandy	GS: 1-3%	M	ANY	IV
	all but sandy	MS: 3-8%	N to M	ANY	IV
Any Ponded Soil					V
>50	S or LS	NL: 0-1%	S to VS	S to R	VI
	S or LS	GS: 1-3%	S to VS	S to R	VI
	S or LS	MS: 3-8%	S to VS	MR to R	VI
	S or LS	SS: 8-12 %	S to VS	MR to R	VI
	S or LS	ST to VS: 12%+	ANY	MR to R	VI
	all but sandy	GS: 1-3	S to VS	VS to MR	VI
	all but sandy	MS: 3-8%%	S to VS	VS to MR	VI
	all but sandy	SS: 8-12 %	S to VS	S to MR	VI
	all but sandy	ST to VS: 12%+	ANY	S to MR	VI
<50	all but sandy	NL: 0-1%	S to VS	ANY	VI
	all but sandy	GS: 1-3%	S to VS	ANY	VI
	all but sandy	MS: 3-8%	S to VS	ANY	VI
	all but sandy	SS: 8-12 %	N to S	ANY	VI

	all but sandy	ST to VS: 12%+	N to S	ANY	VI
>50	all but sandy	ST to VS: 12%+	ANY	VS	VII
<50	all but sandy	SS to VS: 8-12 %+	VS	ANY	VII

*** Permeability/Soil Layer refers to the most limiting soil layer, and not Cr or R horizons.**

**** Poorly drained and frequently flooded soils are excluded from the concept of Class I and should be considered Class II if they otherwise meet all of the other criteria for Class I.**

Attachment 2 – NACTA Rating Guides

NACTA Rating Guide for **ROADFILL**

Property	**Good**	**Fair**	**Poor**	**Feature**
Depth to bedrock	> 150 cm.	100 -150 cm.	< 100 cm.	Depth to Rock
Depth to root limiting layer	> 150 cm.	100 – 150 cm.	< 100 cm.	Limiting Layer
Shrink Swell	< 8 cm. clay	8 – 16 cm. clay	> 16 cm. clay	Shrink Swell
Texture (avg. 25 – 100 cm.)	S, LS, SL	L, SCL	all others	Low Strength
% >8 cm. stones, 0 to 40 cm.	< 25%	25 – 50%	> 50%	Large Stones
Depth to high water table	> 90 cm.	30 – 90 cm.	< 30 cm.	Wetness
Slope	< 15%	15 – 25%	> 25%	Slope

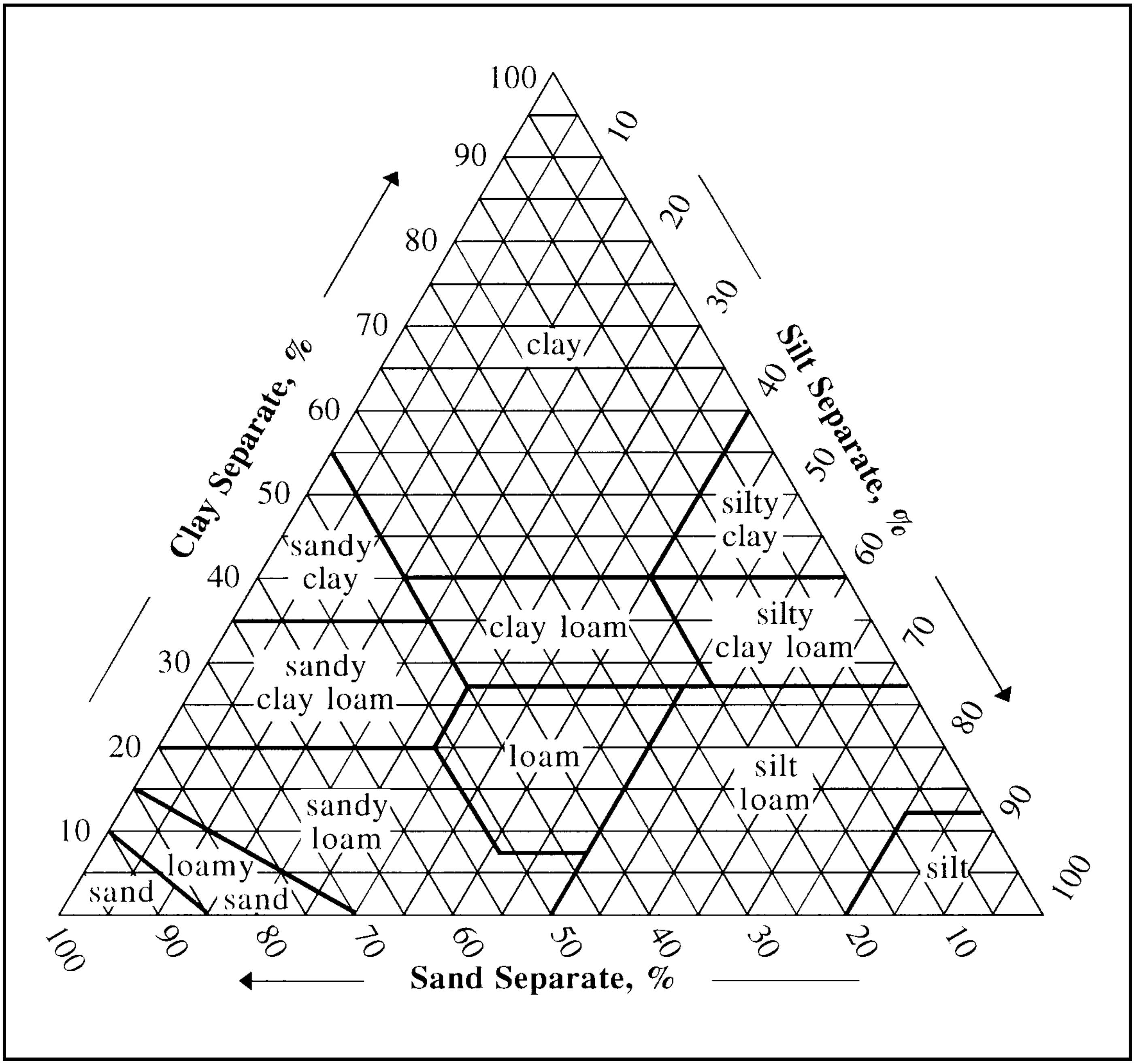
NACTA Rating Guide for **SEPTIC TANK ADSORPTION FIELDS**

Property	**Slight**	**Moderate**	**Severe**	**Feature**
Flooding	none	Rare	freq. / occas.	Flooding
Depth to bedrock	> 180 cm.	100 – 180 cm.	< 100 cm.	Depth to Rock
Depth to root limiting layer	> 180 cm.	100 – 180 cm.	< 100 cm.	Limiting Layer
Ponding	no	**-------**	yes	Ponding
Depth to high water table	> 180 cm.	120 – 180 cm.	< 120 cm.	Wetness
Permeability (60 – 150 cm.)	S, LS, SL	SCL, L, SIL, SI	all others	Percs Slowly
Permeability (60 – 150 cm.)	all others	------	S, LS	Poor Filter
Slope	< 8%	8 – 15%	> 15%	Slope
% > 8 cm. stones, 0 to 40 cm.	< 25%	25 – 50%	> 50%	Large Stones

NACTA Rating Guide for **SEWAGE LAGOONS**

Property	Slight	Moderate	Severe	Feature
Permeability (30 – 150 cm.)	all others	SCL, L, SIL, SI	S, LS, SL	Seepage
Depth to bedrock	> 150 cm.	100 – 150 cm.	< 100 cm.	Depth to Rock
Depth to root limiting layer	> 150 cm.	100 – 150 cm.	< 100 cm.	Limiting Layer
Flooding	none, rare	------	occas., freq.	Flooding
Slope	< 2%	2 – 7%	> 7%	Slope
Ponding	no	------	yes	Ponding
Depth to high water table	> 150 cm.	110 – 150 cm.	< 110 cm.	Wetness
% >8 cm. stones, 0 to 40 cm.	< 20%	20 – 35%	> 35%	Large Stones

Attachment 3 - USDA SOIL TEXTURAL TRIANGLE



Attachment 4 – NACTA SOILS CONTEST
2-Year Division
SITE CARD

SITE NO.____________________

Describe ______________ horizons to a depth of ________________ cm.

Red marker is in the third horizon at _______________ cm.

This site floods ______________ times within ________________ years.

Attachment 5 -APPLICATION FOR SELECTED INTERPRETATIONS

LAND CAPABILITY CLASSIFICATION

Land Capability Class – reading from top to bottom, select the Land Capability Class in which the soil description is answered "Yes" to all of the listed characteristics.

- Depth (cm) – the depth of the soil from the surface to a loot limiting layer (i.e., duripan, fragipan, dense glacial till, petrocalcic, lithic, or paralithic contact).
- Surface Texture – as identified on Line 1, Texture Column, on Part I of the scorecard.
- Slope – as identified on Item 3, Slope, on Part II of the scorecard.
- Erosion – as identified on Item 5, Erosion, on Part II of the scorecard.
- Permeability/Soil Layer – refers to the most restrictive layer of soil excluding Cr & R horizons.

ROADFILL

PROPERTY	FACTOR	INTERPRETATION
Depth to root limiting layer		Should be interpreted as any root limiting layer not including bedrock
Shrink Swell	Clay	Clay is to be interpreted as Sandy clay, Silty clay, and Clay
Texture (avg. 25 – 100 cm.)	Textural classes	The average between 25 and 100 cm.

SEPTIC TANK ABSORPTION FIELDS

PROPERTY	FACTOR	INTERPRETATION
Flooding	Rare	1-5 times per 100 years
(SSM 3-100)	Occasional	6-50 times per 100 years
	Frequent	More than 50 times per 100 years
Depth to root limiting layer		Should be interpreted as any root limiting layer not including bedrock
Ponding	Yes	Class V would be the best possible Land Class
	------	Not a possible choice
Permeability (60–150 cm)	Textural classes	Any layer of the specified texture class existing between 60 and 150 cm.
	------	Not a possible choice

SEWAGE LAGOONS

PROPERTY	FACTOR	INTERPRETATION
Permeability (30–150 cm.)	Textural classes	Any layer of the specified texture class existing between 30 and 150 cm.
Flooding	Rare	1-5 times per 100 years

(SSM 3-100)	Occasional	6-50 times per 100 years
	Frequent	More than 50 times per 100 years
	------	Not a possible choice
Depth to root limiting layer		Should be interpreted as any root limiting layer not including bedrock
Ponding	Yes	Class V would be the best possible Land Class
	------	Not a possible choice