1st EUROPEAN SOIL JUDGING CONTEST
HANDBOOK

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JUDGING CONTEST
ALCOI-ALICANTE-SPAIN 2025

CREDITS:

This **handbook** has been elaborated by some members of the Scientific Committee: P, Schad[1], R.M. Poch[2], J. Galbraith[3], D. Badía[4], it has been updated to reflect the latest versions of the WRB and ST classification systems, and adapted to the new format of the contest, which requires participants to classify soil profiles using both systems.

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0. GENERAL INFORMATION

Soil judging contests have proven to be an excellent tool and educational strategy for teaching soil science and raising awareness about the importance of this discipline among new generations of soil scientists. Following the success of previous contests held during past World Soil Congresses and taking advantage of the VII EUROSOIL being held this year in Seville, Spain, we saw a perfect opportunity to launch the 1st European Soil Judging Contest. The event will take place in the mountains of Alicante, around two beautiful Natural Parks: 'Sierra de Mariola' and 'Font Roja'. We are confident that you will enjoy this experience while learning to describe and classify soil profiles — and that, as a result, a new generation of soil enthusiasts will emerge.

HANDBOOK FOR THE SOIL JUDGING COURSE AND CONTEST

This handbook provides the guidelines for conducting the competition, as well as basic information about the physical environment and soil-forming factors in the Alcoià and Comtat counties, where the course and competition take place.

The objective is for participants to apply their knowledge and practical skills to describe, understand, classify, and interpret soil characteristics in the field. Participants (both in teams and individually) will describe a series of competition soil profiles using basic field tools, selected standards, and guidelines provided in this handbook, which will also be covered during field training.

The winners will be those who demonstrate the greatest ability to accurately describe each soil, classify it, assess its possible functions, and interpret its capacity to perform under different land uses and management practices.

SOIL JUDGING COURSE

The soil interpretation course will consist of four days of theoretical and practical field classes taught by expert faculty in each topic. A general site description, guidelines for profile description, and soil classification standards will be provided.

Local soil experts will present the landscape and soil conditions of the Alcoià and Comtat counties, with a focus on the competition area. Classroom sessions will be followed by practical demonstrations of field procedures and techniques.

Standard samples will be provided for training in texture classification, clay and sand percentage assessment. The soils studied will cover a diverse geographic area with a range of topographic conditions, parent materials, and soil moisture regimes found in the Alcoià and Comtat counties.

EQUIPMENT AND REFERENCE MATERIALS

The teams are requested to bring the following:

- Printed copy of the WRB, 4th edition 2022 with errata corrections from 24 September 2024 (no older versions allowed):

https://wrb.isric.org/files/WRB_fourth_edition_2022-12-18_errata_correction_2024-09-24.pdf

- Printed copy of the Keys to Soil Taxonomy, 13th edition 2022 (no older versions allowed), Chapters 1,2, 3, 4, 5, 8, 11, 12 https://www.nrcs.usda.gov/sites/default/files/2022-09/Keys-to-Soil-Taxonomy.pdf

- Munsell® Soil Color Charts

The following equipment will be available in the soil pits, but in limited numbers. Therefore, each team is encouraged to bring their own, especially the items marked an asterisk (*).

- Field knife or digging tool*

- Magnifying glasses or hand lenses*

- Water bottle* (we will provide extra water at each site)

- Clinometer (we will provide one that can be borrowed at each site)
- 2 mm sieve (if desired for gravelly soils)
- Old towel to clean hands and tools
- Printed copy of the Field Book for Describing and Sampling Soils, Version 4.0 (older versions allowed) (Soil Survey Staff, 2024)

Teams are requested to bring their own Munsell® Soil Color Charts, preferably the latest edition (the organizers can only provide a very limited number). The contest host will provide HCl and soil containers to carry small soil samples.

GENERAL SCHEDULE

Thursday 28/08/2025	Online (3h)	• Presentation of the course-competition dynamics and structure, materials. • The Soil Judging Contests (summary of previous ones, history of SJC (including Video John at UMH). • Fundamentals of soil description and classification manuals (World Reference Base for Soil Resources and Soil Taxonomy).
Monday 01/09/2025	Morning (indoor)	• Travel by bus from Alacant bus station to Alcoi. • Reception of participating teams. • Introduction to the study environment: soil-forming factors and processes in the region. Land uses, including disturbances (e.g. wildfires).
	Afternoon (indoor)	• Description of site properties and soil profiles (color, texture, structure, horizon differentiation) and identification of diagnostic horizons (Sections 1, 2, and 5 of this handbook). NRCS Field Book and the WRB Field Guide.
Tuesday 02/09/2025	Morning (indoor)	• Introduction to the World Reference Base for Soil Resources (WRB) (Section 5.1.).
	Afternoon (field)	• Visit to two soil profiles to apply the knowledge acquired in the classroom (Soil Profiles 1 and 2).
Wednesday 03/09/2025	Morning (indoor)	• Soil Interpretations (Section 4). Introduction to Soil Taxonomy (Section 5.2).
	Afternoon (indoor)	• Visit to two soil profiles to apply the knowledge acquired in the classroom (Soil Profiles 3 and 4).
Thursday 04/09/2025	Morning (field)	• **Training (Teams)** Field training with a visit to two soil profiles. Competition simulation (Soil Profiles 5 and 6).
	Afternoon (field)	• **Competition (Teams)** First phase of the competition Teams (Soil Profiles 7 and 8).
Friday 05/09/2025	Morning (field)	• **Competition (Individual)** Second phase of the competition Individuals (Soil Profiles 9 and 10).
	Afternoon	• Organizers: Scoring: evaluation of results and ranking of winners (individual, team and overall). • Participants: Free time.
	Evening	• Closing dinner and awards.
Saturday 06/09/2025	Morning	• Travel by bus from Alcoi to Alicante.
Thursday 25/09/2025 (tbd)	Online (3h)	• Post course: Detailed discussion of the soil profiles studied in the competition. • Feedback from participants.

If you arrive by train, please be informed that real knives are not allowed in Spanish fast trains. When presenting a letter of information, why you need the knife, the railway staff will normally accept the knife. This letter can be sent to participants by the Universidad Miguel Hernández.

All participants are encouraged to bring their own sunscreen, insect repellent, boots, hat, and any other essential personal items, as these will not be provided by the organizing team.

TRAINING AND COMPETITION DAYS

In each pit/profile a section will be selected and clearly designated as the control section by the competition organizers. The control section will be used to measure depths and horizon boundaries; it will serve as the officially graded profile and must remain undisturbed. All measurements must be taken within a specifically designated area. A measuring tape will be placed in the control section in all pits and will remain there throughout the training/competition.

A specified number of horizons will be described down to a specified depth. A nail will be placed at the bottom of the third horizon from the top of the profile. Each site will have a sign displaying information about the elevation of the point, the profile depth to be considered, the number of horizons to be identified and described, and any chemical or physical data required for classification.

Each participant will receive one scoresheet per profile. The organizing team will provide all scoresheets; a sample scoresheet can be found at the end of this handbook. The scoresheets must be completed based on laboratory information and the instructions in this handbook.

Teams will be randomly assigned a color and team name during registration. Individual contestants will be assigned a team name and a letter, which will be used to identify their scoresheets and training rotation schedule. Team coaches will receive a training schedule, the complete laboratory dataset, and filled-in practice scoresheets for reference.

INDIVIDUAL COMPETITION FORMAT

Each contestant will have seventy minutes to evaluate each soil and site in the individual competition. Contestants will be randomly divided into two groups. At the first site, Group 1 will follow this schedule:

1. **10 minutes in the profile,**
2. **10 minutes out of the profile,**
3. **15 minutes in the profile,**
4. **15 minutes out the profile, and**
5. **20 minutes of free time for all.**

Group 2 will follow the opposite schedule of entry and exit. At the second site, the groups will switch schedules, with Group 2 entering the pit first. Contestants may take a sample from the surface horizon while outside the pit, provided they do not enter or disturb those already inside. These procedures may be modified before the competition due to unforeseen circumstances.

General Rules for the Individual Competition:

• Contestants must use the official abbreviations (codes) found in this handbook.

• Contestants may not talk to each other.

• Contestants may not use mobile phones, tablets, PDAs, or communication devices, but they may keep them on hand in case of a health emergency.

• Contestants may carry health-related items during the competition (such as inhalers or allergy medication).

• Contestants may use the equipment provided at the site and the permitted standards.

• Each contestant will describe two soil profiles. The final individual score will be the average of the two profiles evaluated individually.

TEAM COMPETITION FORMAT

Each team will have seventy minutes to describe and evaluate each of the two sites assigned to teams. The time will be divided into intervals, similar to the individual competition. Teams starting at the first pit will begin second at the second profile. All contestants in each team may participate in the team competition.

The general rules for the team competition are the same as those for the individual competition, with the following exceptions:

• Team members may talk to other members of their team (only within their own team), provided their conversation is not loud enough to be heard by other teams.

• A maximum of four and a minimum of three students may compete per team in the team evaluation competition.

• Each team will describe two soil profiles. The final team score will be the average of the two profiles evaluated by the team.

• the overall score, only the three best individual scores in each evaluated profile will count toward the team's final score. Both profile scores evaluated by each team will be considered. The final team score will consist of the six best individual scores plus the two team scores.

1. SITE CHARACTERISTICS

1.1. LAND USE

Task on the scoresheet: Indicate the land use according to Table 1.

Table 1: Land use (IUSS Working Group WRB, 2022, Table 8.9, modified)

Land-use type	Code
Perennial crop production (e.g. food, fodder, fuel, fiber, ornamental plants)	CPP
Annual crop production (e.g. food, fodder, fuel, fiber, ornamental plants)	CPA
Fallow, less than 12 months, with spontaneous vegetation	FYO
Fallow, at least 12 months, with spontaneous vegetation	FOL
Fallow, all plants constantly removed (dry farming)	FDF
Pasture on (semi-)natural vegetation	GNP
Intensively-managed grassland, pastured	GIP
Intensively-managed grassland, not pastured	GIN
Forestry	FOR
Simultaneous agroforestry system	AFS
Nature protection	NPR
Settlement, industry	SEI
Military area	MAR
Other land uses	OLU
Not used and not managed	NOL

1.2. SLOPE POSITION OF THE PROFILE

Task on the scoresheet: Determine the position according to Figure 1. Use the codes indicated in Table 2.

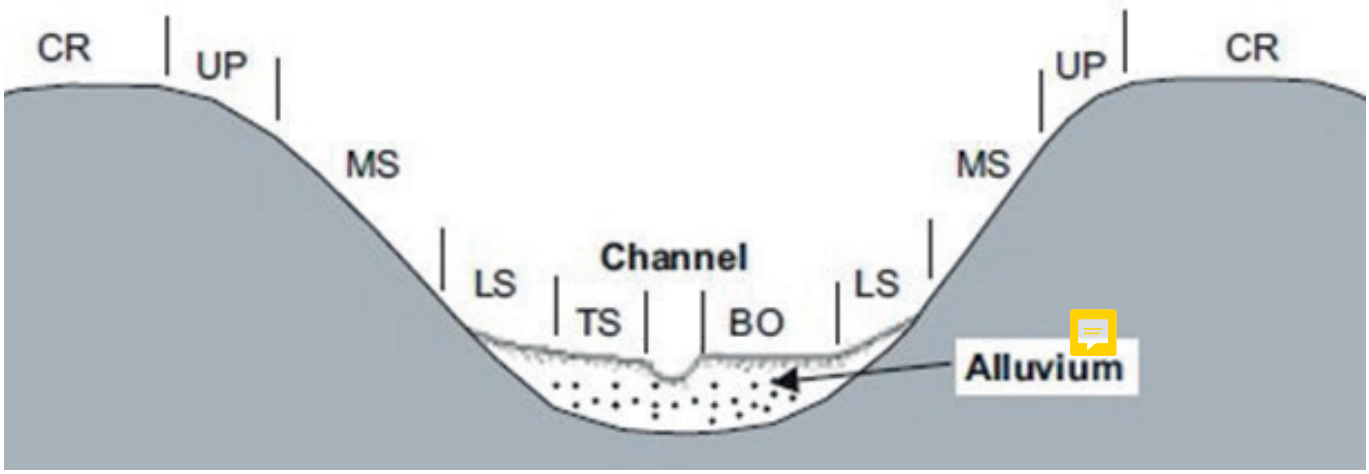


Figure 1: Slope position in undulating and mountainous terrain (Soil Survey Staff, 2024, modified)

Table 2: Slope position in undulating/mountainous terrain (Soil Survey Staff, 2024, modified)

Position in undulating/mountainous terrain	
Landform	**Code**
Crest (summit)	CR
Upper slope (shoulder)	UP
Middle slope (backslope)	MS
Lower slope (foot slope)	LS
Toe slope	TS
Bottom (flat terrace or floodplain)	BO

1.3. SLOPE GRADIENT

Task on the scoresheet: Determine the slope gradient in %. Slope stakes will be provided and placed on the same landscape position as the pit.

1.4. EROSION

Task on the scoresheet: Determine the dominant erosion category using Table 3 and the degree of erosion using Table 4 . An area will be marked for evaluating erosion, and students should not walk in that area. If the category of erosion in the area is “NO”, the degree of the erosion must be ∅.

Table 3: Erosion by category (IUSS Working Group WRB, 2022, Table 8.21, modified)

Category	Code
Water erosion	
Sheet erosion	WS
Rill erosion	WR
Gully erosion	WG
Aeolian (wind) erosion	
Shifting sands	AS
Other types of wind erosion	AO
Water and aeolian (wind) erosion	WA
Mass movement (landslides and similar phenomena)	MM
Erosion, not categorized	NC
No evidence of erosion	NO

Table 4: Erosion by degree (IUSS Working Group WRB, 2022, Table 8.22, modified)

Criterion	Degree	Code
Not applicable	None	∅
Some evidence of damage to surface layers	Slight	S
Clear evidence of removal of surface layers	Moderate	M
Surface layers completely removed and subsurface layers exposed	Severe	V

1.5. SURFACE STONINESS AND ROCK OUTCROPS

Task on the scoresheet: Estimate on the soil surface the abundance of larger rock fragments (also called larger coarse fragments) and larger rock outcrops, both with a Ø > 15 cm, in % of the surface area covered. You can use the visual estimation graphs of Annex 2. An area for evaluation will be marked.

1.6. HUMAN-MADE SURFACE UNEVENNESS

Task on the scoresheet: Report the type of human-made surface unevenness with an average height difference of ≥ 5 cm (Table 5). Report only if it shows a repeating pattern of two or more. An area for evaluation will be marked.

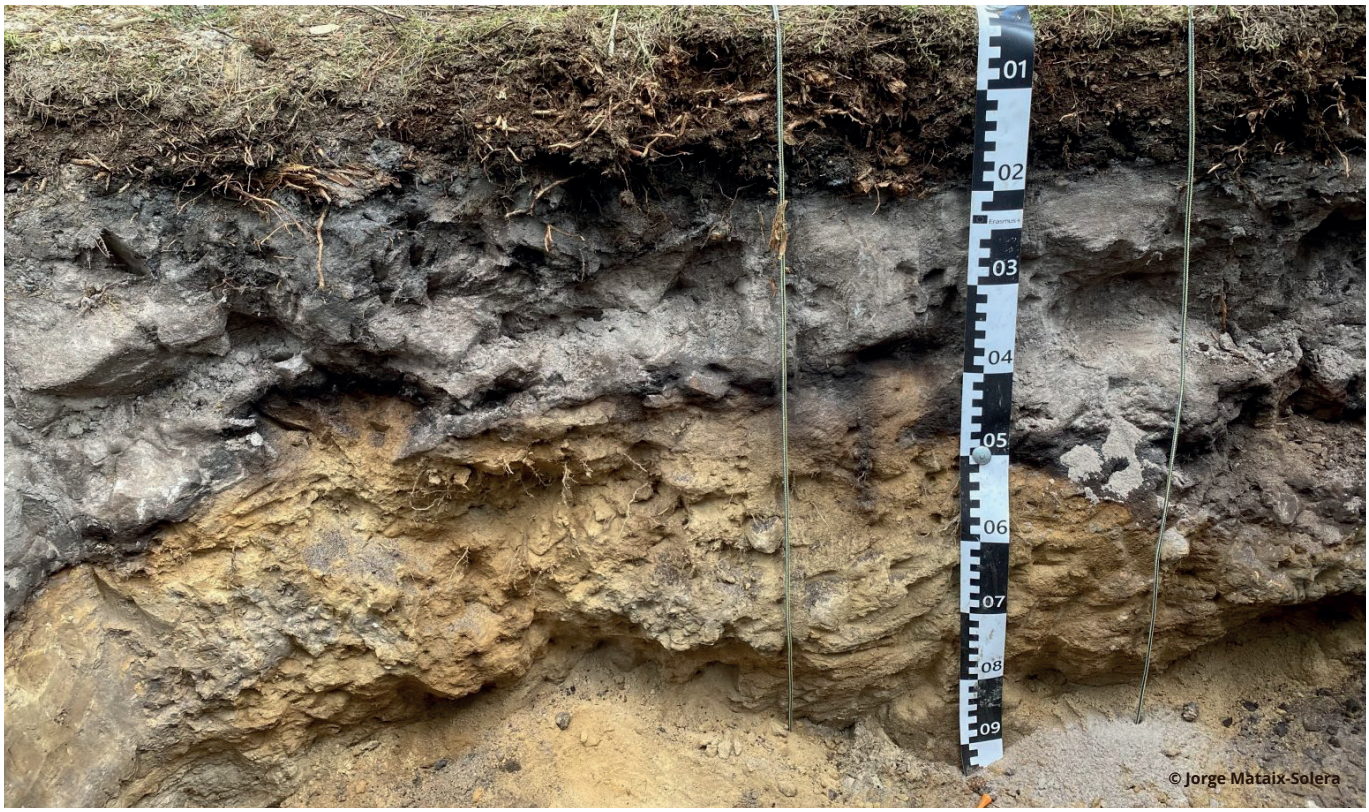
Table 5: Types of human-made surface unevenness (IUSS Working Group WRB, 2022, Table 8.20, modified)

Type	Code
Human-made terraces	HT
Drainage canals	CD
Irrigation canals	CI
None	NO

1.7. LITTER LAYER

Task on the scoresheet: Report the percentage of the area covered by a litter layer and the average thickness of the litter layer in cm. The area to be observed will be marked.

A **litter layer** (WRB) or layer of **freshly fallen plant litter** (ST) is a loose layer that contains > 90% (by volume, related to the fine earth plus all dead plant residues) recognizable dead plant tissues (e.g. undecomposed leaves). The **soil surface** (0 cm) is by convention the surface of the soil after removing, if present, the litter layer. The **mineral soil surface** is the upper limit of the uppermost layer consisting of mineral material.



2. PROFILE DESCRIPTION

GENERAL DEFINITIONS

The **fine earth** comprises the soil constituents ≤ 2 mm. The natural mineral constituents > 2 mm are called **rock fragments** (**coarse fragments**). The **whole soil** comprises fine earth, rock fragments, artefacts, cemented parts and dead plant residues of any size.

In both systems (WRB and ST), a soil **horizon** is a zone in the soil, approximately parallel to the soil surface, with properties different from horizons above and/or below it, and at least one of these properties is the result of soil-forming processes. In ST, the term soil layer is used for a horizontal zone that has not undergone soil-forming processes. In WRB, the term soil layer comprises all horizontal zones, whether or not they have undergone soil-forming processes. For simplification, in the following, we will mostly use the word 'horizon'.

Organic material in WRB has ≥ 20% (by mass) organic carbon. Organic soil material in ST has ≥ 12% (by mass) organic carbon.

In some of the sections, concentrations (accumulations) have to be reported. The definitions are given in Table 6.

Table 6: Types of concentrations (IUSS Working Group WRB, 2022, Table 8.51)

Description	Designation
Rounded body, at least very weakly cemented, that can be removed as discrete unit, with internal organization in the form of concentric layers visible to the naked eye	Concretion
Rounded body, at least very weakly cemented, that can be removed as discrete unit, without evident internal organization	Nodule
Longitudinal body of any cementation class	Filament
Non-cemented or extremely weakly cemented body, of various shape, that cannot be removed as discrete unit	Mass
Covering the surfaces of coarse fragments, remnants of a broken-up cemented layers, aggregates or pore walls	Coating

2.1. HORIZON BOUNDARIES

Task on the scoresheet: Determine the depth (cm) from the soil surface to the lower boundary of each horizon. Determine the distinctness of the horizon boundaries according to Table 7 and the shape (topography) of the horizon boundary according to Table 7. and Figure 2. No distinctness nor shape are described for the lowest horizon.

Table 7: Classification of horizon boundaries by distinctness and shape (IUSS Working Group WRB, 2022, tables 8.30 and 8.31, modified)

Distinctness			Shape (topography)		
Transition within (cm)	Class	Code	Determination	Class	Code
≤ 2	Abrupt	A	Nearly plane surface	Smooth	S
> 2 - 5	Clear	C	Pockets less deep than wide	Wavy	W
> 5 - 15	Gradual	G	Pockets more deep than wide	Irregular	I
> 15	Diffuse	D	Discontinuous	Broken	B

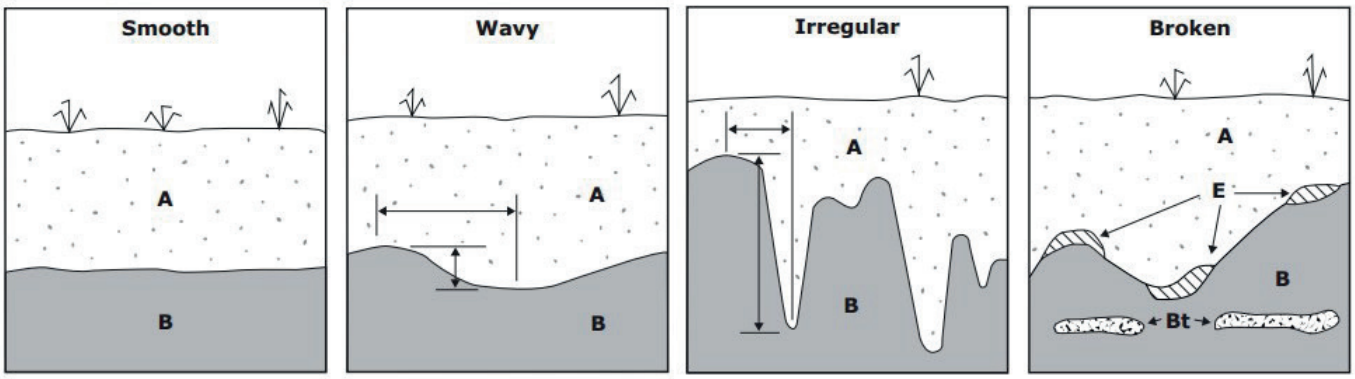


Figure 2: Shape (topography) of horizon boundaries (Soil Survey Staff, 2024, 2-7)

2.2. TEXTURE

The texture classes of the fine earth (≤ 2 mm) and their codes are indicated in the texture triangle (Figure 3). The colors in the triangle are related to the texture qualifiers of the WRB.

Task on the scoresheet: Indicate the texture class of each mineral horizon, which can be determined with the help of the flow chart (Figure 4). In addition, estimate the clay and sand content for each mineral horizon. This estimate is useful for indicating increases or decreases in clay and/or sand content within texture classes and for comparing field estimates with analytical results.

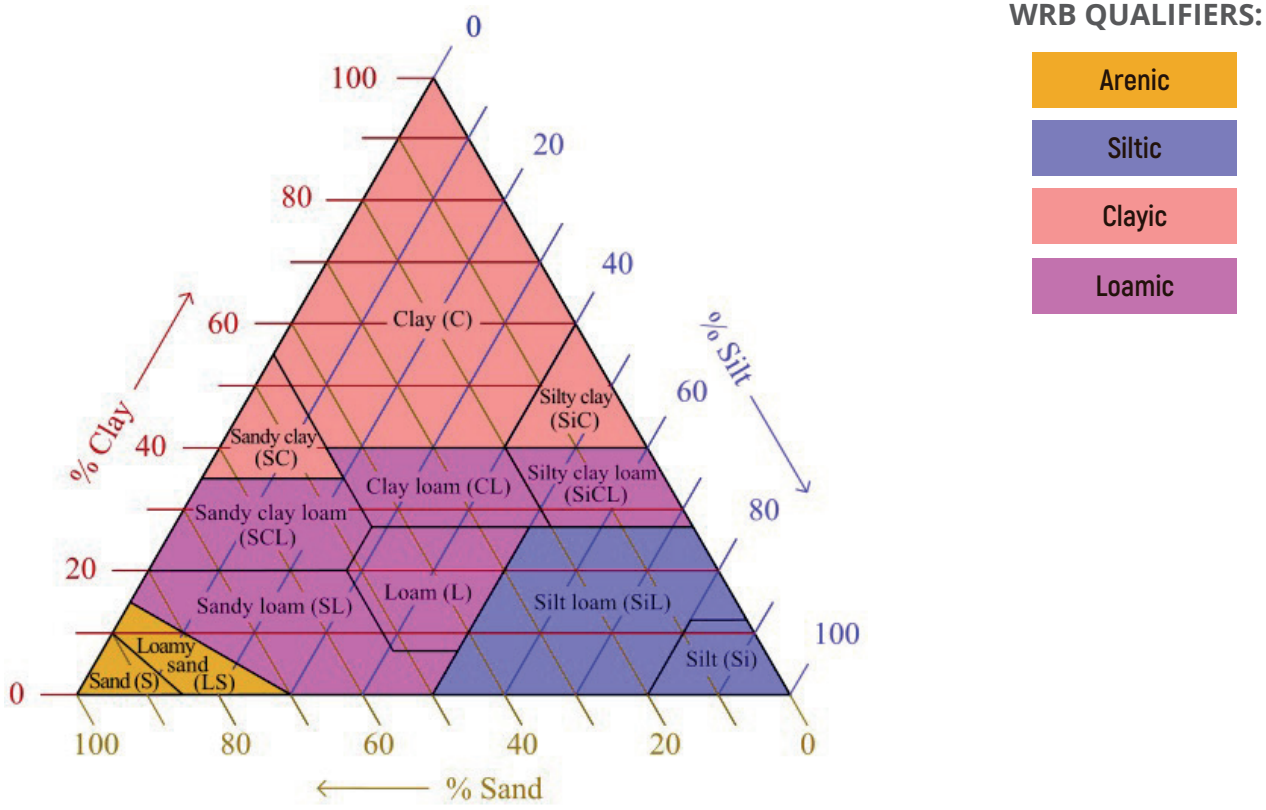


Figure 3: Texture classes with codes and with the correlation with the WRB texture qualifiers (IUSS Working Group WRB, 2022, Figure 8.13

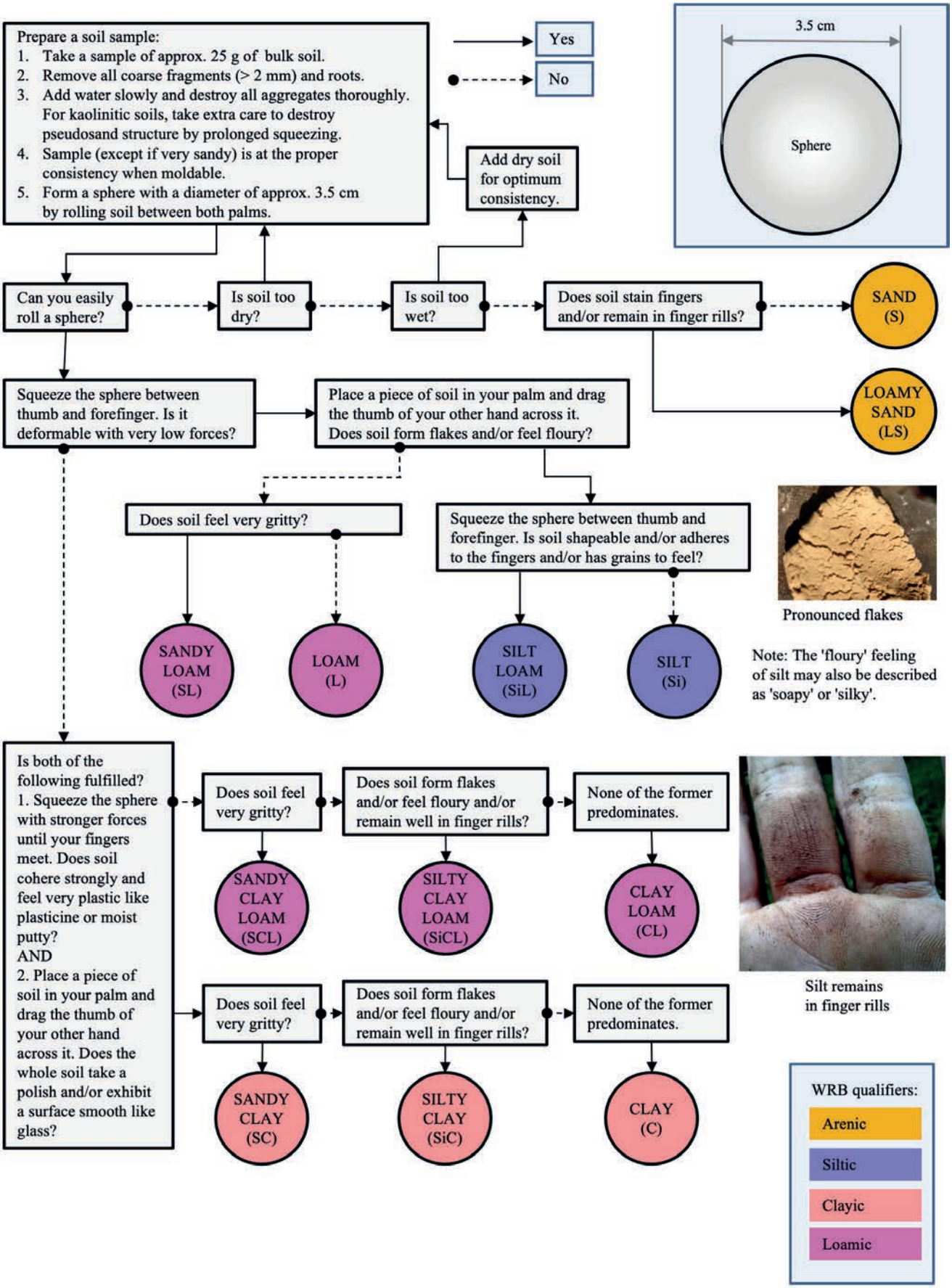


Figure 4: Flow chart for the determination of texture classes (IUSS Working Group WRB, 2022, Figure 8.14)

2.3. ROCK FRAGMENTS AND ARTEFACTS (RF/AF)

Task on the scoresheet: Estimate the abundance of rock fragments (also called: coarse fragments) (particles > 2 mm) by volume in %. You may refer to the Figure in Annex 2 for estimating percentages. If artefacts > 2 mm are present, they are included in this estimation. After estimating the abundance for every horizon, a weighted average must be calculated from the mineral soil surface to 100 cm or to continuous rock or to a cemented layer with a cementation class of at least moderately cemented, whichever is shallower.

2.4. STRUCTURE

Task on the scoresheet: Record the dominant structure type for each horizon using Figure 5 and Table 8. Record the dominant structure grade for each horizon using the codes indicated in Table 9. If the structure type is SGR or MA, the structure grade must be ⌀.

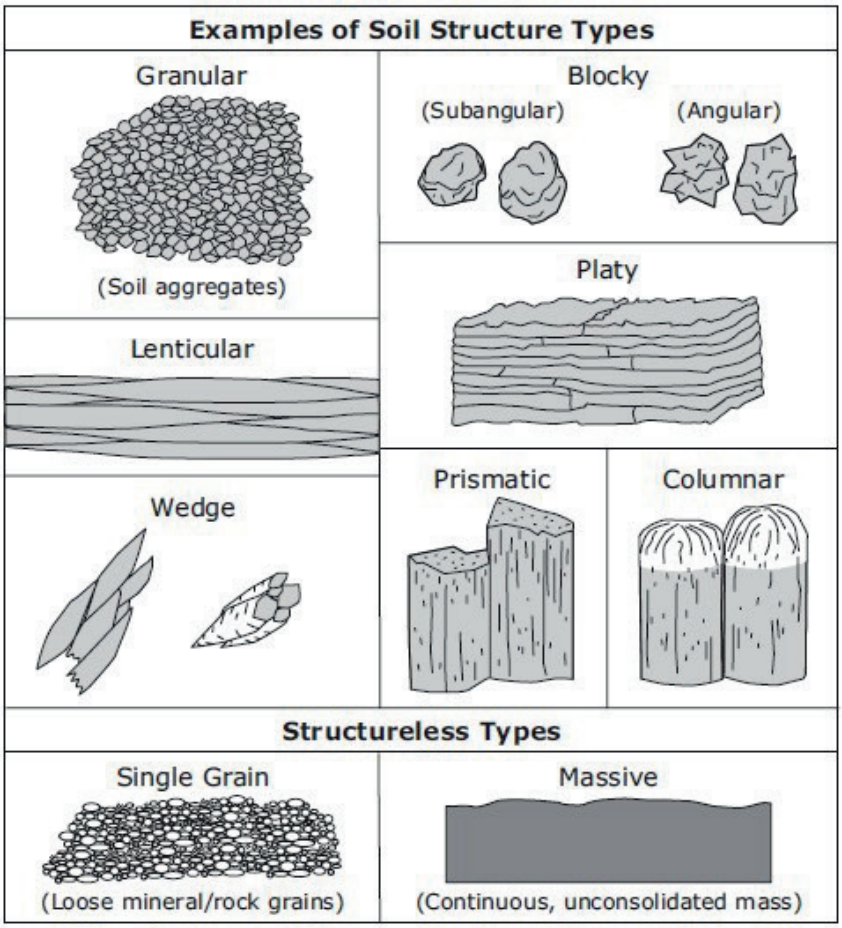


Figure 5: Types of soil structure, figures (Soil Survey Staff, 2024)

Table 8: Types of soil structure, definitions (Soil Survey Staff, 2024, modified)

Determination	Type	Code
NATURAL SOIL STRUCTURAL UNITS (pedogenic structure)		
Small polyhedrals with curved or very irregular faces.	Granular	GR
Polyhedrals with faces that intersect at sharp angles (planes).	Angular blocky	ABK
Polyhedrals with subrounded and planar faces lacking sharp angles.	Subangular blocky	SBK
Flat and platelike units.	Platy	PL
Elliptical, interlocking lenses that terminate in acute angles; not limited to vertic materials.	Wedge	WEG
Vertically elongated units; flat tops.	Prismatic	PR
Vertically elongated units with rounded tops that commonly are “bleached.”	Columnar	COL
STRUCTURELESS		
No structural units; entirely noncoherent; e.g., loose sand.	Single grain	SGR
No structural units; material is a coherent mass (not necessarily cemented).	Massive	MA
ARTIFICIAL FRAGMENTS OR CLODS (nonpedogenic structure)		
Irregular blocks created by artificial disturbance; e.g., tillage or compaction.	Cloddy	CDV

Table 9: Grade of structural units (IUSS Working Group WRB, 2022, Table 8.43, modified)

Criterion	Grade	Code
Structureless		∅
The units are barely observable in place. When gently disturbed, the soil material parts into a mixture of whole units, broken units and much material that is not in units. Aggregate surfaces differ in some way from fractured surfaces.	Weak	W
The units are well formed and evident in place. When gently disturbed, the soil material parts into a mixture of mostly whole units, some broken units, and material that is not in units. Aggregates part from adjoining aggregates to reveal nearly entire faces that have properties distinct from those of fractured surfaces.	Moderate	M
The units are distinct in place. When gently disturbed, they separate cleanly, mainly into whole units. Aggregates have distinct surface properties.	Strong	S

2.5. CARBONATES

Task on the scoresheet: Estimate the $CaCO_3$ content of the fine earth adding some drops of 10% HCl to the soil. Use the codes indicated in Table 10.

Indicate the dominant types (maximum 2) of secondary carbonates according to Table 11 (with the help of Table 6). Additionally, report the total exposed area covered by secondary carbonates of any type. Report it in % related to the fine earth plus accumulations of secondary carbonates of any size and any cementation class.

Table 10: Carbonate contents (IUSS Working Group, 2022, Table 8.62)

Criterion	Content	% (by mass)	Code
No visible or audible effervescence	Non-calcareous	0	NC
Audible effervescence but not visible	Slightly calcareous	> 0 - 2	SL
Visible effervescence	Moderately calcareous	> 2 - 10	MO
Strong visible effervescence, bubbles form a low foam	Strongly calcareous	> 10 - 25	ST
Extremely strong reaction, thick foam forms quickly	Extremely calcareous	> 25	EX

Table 11: Types of secondary carbonates (IUSS Working Group WRB, 2022)

Type	Code
Masses (including spheroidal aggregations like white eyes (byeloglaska); including masses filling the complete fine earth)	MA
Nodules and/or concretions	NC
Filaments (including continuous filaments like pseudomycelia)	FI
Coatings on soil aggregate surfaces or biopore walls	AS
Coatings on undersides of coarse fragments and of remnants of broken-up cemented layers (with or without coatings on other sides)	UR
No secondary carbonates	NO

2.6. SOIL COLOR

Task on the scoresheet: Use the Munsell® Soil Color Charts to determine the moist color of each horizon described. Colors must be designated by Hue, Value and Chroma.

Take a fresh sample, slightly crush it and observe the color in the shade (both your eyes and the color chart in the shade). The moist state corresponds to field capacity, which is obtained with sufficient accuracy by moistening and reading the color as soon as visible moisture films have disappeared.

2.7. REDOXIMORPHIC FEATURES

Task on the scoresheet: Indicate the locations of the dominant oximorphic feature and the dominant reductimorphic feature according to Table 12 and Table 13 with the help of Figure 6. Report the total abundance of oximorphic features and reductimorphic features, both for inner and outer locations, separately. Report them as percentage of the exposed area (related to the fine earth plus oximorphic features of any size and any cementation class).

Redoximorphic features (RMF) are soil morphological features caused by reduction processes or by reduction and subsequent re-oxidation processes. The reduction/oxidation of iron (Fe) and, to a lesser extent, manganese (Mn) minerals is the cause for most RMF features. Iron is a major pigment that influences soil color. The loss, accrual, and valence/mineral state of Fe are major determinants of color patterns within or across soil horizons.

Fe or Mn reduction occurs when free oxygen is excluded from a soil volume or horizon by water saturation for extended time. Reduced iron (Fe^{2+}) is comparatively much more soluble and mobile than oxidized iron (Fe^{3+}) and moves with water flow and due to redox gradients. Reduced Fe and Mn are oxidized and precipitate when water drains from soil (re-entry of free oxygen in soils with stagnant water), or where oxygen is present in, or along, soil pores, including root channels, or along roots (typical for soils with ascending groundwater). The re-oxidized Fe or Mn form concentrations like masses, concretions nodules (Table 6). Oxidized Fe generally has a redder or yellower and more intense color than adjacent soil particles, while Mn often has a darker color than adjacent soil particles.

Table 12: Location of oximorphic features (IUSS Working Group WRB, 2022, Table 8.55, modified)

Location		Code
Inner parts	Inside soil aggregates: masses	OIM
	Inside soil aggregates: concretions	OIC
	Inside soil aggregates: nodules	OIN
	Inside soil aggregates: combinations of masses, concretions and nodules	OIB
Outer parts	On surfaces of soil aggregates	OOA
	Adjacent to surfaces of soil aggregates, infused into the matrix (hypocoats)	OOH
	On biopore walls	OOE
Random (not associated with aggregate surfaces or pores)	Distributed over the layer, neighboring areas with reductimorphic features	ORS
	Throughout	ORT

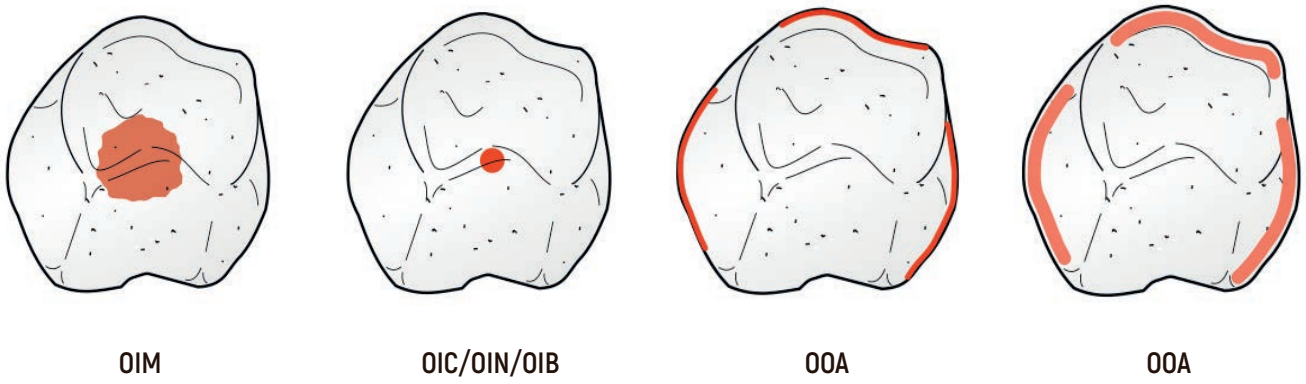


Figure 6: Location of some oximorphic features (IUSS Working Group WRB, 2022, Figure 8.19)

Table 13: Location of reductimorphic features (IUSS Working Group WRB, 2022, Table 8.56)

Location		Code
Inner parts	Inside soil aggregates	RIA
Outer parts	Outer parts of soil aggregates	ROA
	Around biopores	ROE
Random (not associated with aggregate surfaces or pores)	Distributed over the layer, neighboring areas with oximorphic features	RRS
	Throughout	RRT

2.8. AGGREGATE SURFACE FEATURES

Task on the scoresheet: Determine the dominant type of features at the surfaces of aggregates and along biopores, other than redoximorphic features, using Table 14. For slickensides, report the percentage of surfaces of soil aggregates covered. For clay coatings, report the percentage of surfaces of soil aggregates and biopore walls covered.

Clay coatings (Figure 7) result from clay migration and show a shiny appearance due to illuviated clay minerals and a more intense color (usually a higher chroma) due to illuviated iron oxides. If sand grains are present, they are waxed over by clay particles. Stress features (Figure 8) do not differ in color from the interiors of the aggregates. They form when soil aggregates are pressed against each other due to swelling clay minerals. Striations form when sand grains are moved with strong pressure along the surfaces of aggregates sliding past each other.

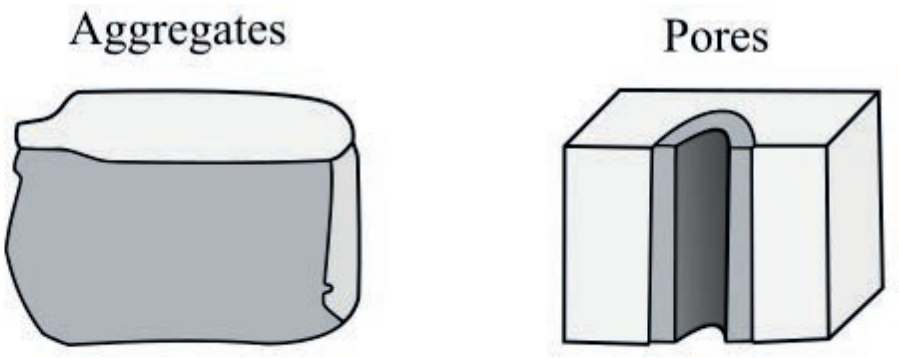


Figure 7: Clay coatings (Soil Survey Staff, 2024, 2-33, and IUSS Working Group WRB, 2022, Figure 8.20)

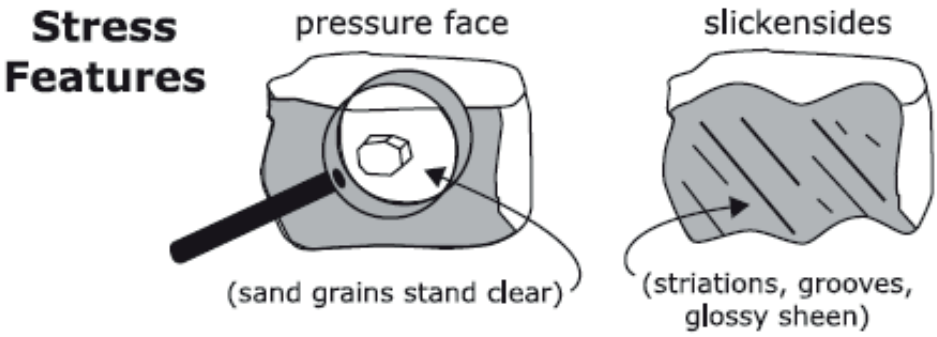


Figure 8: Stress features (Soil Survey Staff, 2024, 2-33)

Table 14: Aggregate surface features

Type	Code
Clay coatings	CC
Slickensides	SS
Pressure faces	PF
None	NO

2.9. PARENT MATERIAL

Task on the scoresheet: Determine the parent material according to Table 15: Types of parent material in the study area.

Table 15: Types of parent material in the study area

Parent material	Code
Calcareous sandstones	CA
Conglomerates with calcareous cement	CO
Coherent limestones	RL
Calcilutites (Calcareous marls)	CL
Fine detritic colluvial materials (mostly ≤ 2 mm)	FC
Coarse detritic colluvial materials (mostly > 2 mm)	CC
Alluvial materials	AL

Contestants place an 'X' in one box only for each of the following characteristics to be assessed.

3.1. ROOTING DEPTH AND TYPE OF RESTRICTIVE LAYER

Task on the scoresheet: Determine the rooting depth class and the type of the restrictive layer.

Rooting depth is defined as the depth from the soil surface to the upper boundary of a root-restrictive layer. (The restrictive layers referred to here are different from the meaning of a 'limiting layer' defined in WRB.) Restrictive layers include:

- **continuous rock (bedrock, lithic or paralithic materials);**
- **rock fragments, ≥ 80% (by volume);**
- **cemented layer;**
- **massive structure.**

If the lower depth of judging is less than 150 cm, and there is no restrictive layer within or at the judging depth, the horizon encountered at the bottom of the judged profile may be assumed to continue further down and 'very deep' should be selected.

3.2. HYDRAULIC CONDUCTIVITY

Task on the scoresheet: Determine the hydraulic conductivity of the mineral surface horizon and of the horizon that has the lowest hydraulic conductivity, including restrictive layers, within the depth specified for the profile. Thia is critical for partitioning of rainfall and agronomic soil functions.

Three hydraulic conductivity classes are used:

- **High (H)** – includes sand and loamy sand texture classes. Sandy loam, sandy clay loam, silt loam and loam texture classes that are especially 'loose' because of very high organic matter content (> 5% organic carbon) also fall into this category. Horizons containing > 60% of coarse fragments with insufficient fine earth to fill voids between fragments are also considered to have high hydraulic conductivity.
- **Moderate (M)** – this includes those materials excluded from 'low' and 'high' classes.
- **Low (L)** – low hydraulic conductivity is indicated with any of the following:

  - Clay, silty clay and sandy clay texture classes having a structure grade of MO or WE or a massive structure.

  - Silty clay loam and clay loam texture classes having a structure grade of WE or a massive structure.

  - Extremely calcareous layers (≥ 25% $CaCO_3$) and cemented layers.

  - Continuous rock (WRB: R layer) or bedrock (ST: Cr or R layers) where the horizon directly above contains reductimorphic features due to prolonged wetness (value ≥4 with chroma ≤2).

3.3. AVAILABLE WATER-HOLDING CAPACITY (AWHC)

Task on the scoresheet: Determine the available water-holding capacity of the soil.

Critical to agronomic interpretations for crop growth, the available water-holding capacity is approximately the water held between field capacity and permanent wilting point. The approximate amount of moisture stored in the soil is calculated for the top 150 cm of the soil profile. This soil thickness may or may not be the same as that designated for the purposes of profile descriptions. The total water is calculated by summing the amount of water held in each horizon - or portion of horizon, if the horizon extends beyond 150 cm. For the calculation of the available water, the properties of the lowest horizon designated for description can be assumed to extend to 150 cm, if no restrictive layer is present. If a restrictive layer (as defined under rooting depth) is present above 150 cm depth, the depth to the restrictive layer should be considered for estimations of available water. Four retention classes will be used (Table 16):

Table 16: Classification of the Available Water-Holding Capacity (AWHC) of a soil

AWHC (cm)	Class	Code
< 7.5	Very low	VL
7.5 to < 15	Low	L
15 to < 22.5	Moderate	MO
≥ 22.5	High	H

The relationship between available water retained per cm of soil and the texture is given in Table 17. Rock fragments are considered to have negligible (assume zero) moisture retention If a soil contains rock fragments, the volume occupied by them must be estimated and the available water-holding capacity corrected accordingly.

For instance, if a silt loam A horizon is 20 cm thick and contains rock fragments which occupy 10% of its volume, the available water-holding capacity of the horizon would be **20 cm × 0.25 cm/cm × [(100-10)/100] = 4.5 cm** of water. Calculate the available water for each horizon to the nearest hundredth, sum all horizons, then round the grand total to the nearest tenth. For example, 14.92 would round to 14.9 in the low class; 15.15 would round to 15.2 in the moderate class.

Table 17: Determination of the AWHC from soil texture

Available Water-Holding Capacity (cm water per cm soil)	Texture classes
0.1	sand, loamy sand
0.15	sandy loam
0.2	sandy clay loam, sandy clay, clay, silty clay, loam, clay loam
0.25	silt loam, silt, silty clay loam

3.4. SOIL DRAINAGE CLASS

Task on the scoresheet: Determine the drainage class according to Table 18 using the shallowest depth with reductimorphic features, sufficient to indicate an (at least seasonal) presence of oxygen-free water. The reductimorphic features are regarded to be sufficient if they cover ≥ 5% of the exposed area (related to the fine earth plus oximorphic features of any size and any cementation class). For this purpose, reductimorphic features inside and outside soil aggregates are counted together.

Critical for understanding how soil influences partitioning of water, flooding, drainage, habitat function, water purification, and construction possibilities. Soil drainage class is a reflection of the rate at which water is removed from the soil by both runoff and percolation. The idea of poor drainage includes groundwater that is constantly flowing and therefore constantly lost and recharged. Landscape position, slope gradient, infiltration rate, surface runoff, and permeability are significant factors influencing the soil drainage class. Reductimorphic features are the common indicators of prolonged water saturation and reduction and are used to assess soil drainage class. If reductimorphic features are not sufficiently present within the specified depth for judging and that depth is less than 150 cm, then assume Class 1: absence of reductimorphic features above 150 cm.

Table 18: Determination of drainage class form depth at which reductimorphic features appear

Description	Class
No reductimorphic features ≤ 150 cm	1
Reductimorphic features starting > 100 and ≤ 150 cm	2
Reductimorphic features starting > 50 and ≤ 100 cm	3
Reductimorphic features starting > 25 and ≤ 50 cm	4
Reductimorphic features starting ≤ 25 cm	5

4. EVALUATION

For most rapid analysis of limitations:

- **Start in the right-hand column of the tables.**
- **Read down the column, checking the criteria.**
- **If one factor is met in the right-hand column, place a mark in the Class 3 box on the scoresheet.**
- **If none are met, check the middle column. If one factor is met in the middle column, place a mark in the Class 2 box on the scoresheet.**
- **If none are met in either the right-hand or middle column, place a mark in the Class 1 box on the scoresheet.**

4.1. LAND SUITABILITY FOR CEREAL PRODUCTION

The suitability for cereal production is evaluated from 8 site and soil characteristics, according to the most limiting characteristic (Table 19).

Table 19: Suitability criteria for cereal production

Characteristics	Evaluation		
	optimal	suitable	not suitable
Flooding	None		Site floods
Slope gradient (%)	≤ 2	> 2 - 15	> 15
Erosion degree	None or slight	Moderate	Severe
Sum of surface stoniness and rock outcrops (%)	≤ 2	> 2 - 5	> 5
Texture class of the thickest horizon having its upper boundary within 20 cm from the mineral soil surface	SL, L, SiL, CL	SiCL, SCL, Si	SC, LC, C, S, LS
Rock fragments in the thickest horizon having its upper boundary within 20 cm from the mineral soil surface (%)	≤ 5	> 5 - 15	> 15
pH value of the thickest horizon having its upper boundary within 20 cm from the mineral soil surface	> 5.5 - 8.5	> 8.5 - 8.9 or > 5.0 - 5.5	≤ 5.0 and > 8.9
Rooting depth (cm)	> 80	> 40 - 80	≤ 40
Lowest hydraulic conductivity within 120 cm from the mineral soil surface	High	Moderate	Low
AWHC of the soil	High, Moderate	Low	Very Low

4.2. LAND SUITABILITY FOR FORESTRY

The suitability for forestry is evaluated from 4 site and soil characteristics, according to the most limiting characteristic (Table 20). The forest may be for production or for nature conservation.

Table 20: Suitability criteria for forestry

Characteristics	Evaluation		
	optimal	suitable	not suitable
Flooding	None		Site floods
1. Rock fragments in the thickest horizon having its upper boundary within 20 cm from the mineral soil surface	≤ 40	> 40 - 80	> 80
2. Rooting depth (cm)	> 40	> 20 - 40	≤ 20
3. AWHC of the soil	Very high or high	Low or moderate	Very low
4. Drainage class	1 to 3	4	5

4.3. LAND SUITABILITY FOR CAMP SITES

The suitability for camp sites is evaluated from 8 site and soil characteristics, according to the most limiting characteristic (Table 21).

Table 21: Suitability criteria for camp sites

Characteristics	Evaluation		
	optimal	suitable	not suitable
Slope position (flooding risk)	None -	-	Site floods
Slope gradient (%)	≤ 8	> 8 - 15	> 15
Sum of surface stoniness and rock outcrops (%)	≤ 2	> 2 - 5	> 5
Texture class in the thickest horizon having its upper boundary within 20 cm from the mineral soil surface	-	LS	SiC, C, SC, S
Rock fragments in the thickest horizon having its upper boundary within 20 cm from the mineral soil surface (%)	≤ 15	> 15 - 35	> 35
AWHC (cm water / cm soil) in the thickest horizon having its upper boundary within 20 cm from the mineral soil surface	> 4	> 2 - 4	≤ 2
Soil drainage class	1-3	4	5
$EC_{1:5}$ (dS/m at 25°C) in the first mineral horizon	≤ 0.2	> 0.2 - 2.3	> 2.3

5. HORIZON DESIGNATION AND SOIL CLASSIFICATION

Teams and individual contestants must give the horizon designations and the classification according to both Soil Taxonomy (ST, 13th edition, 2022) and World Reference Base for Soil Resources (WRB, 4th edition, 2022). The analytical data required for classification will be provided in the field at each pit.

In both systems, the horizon designation consists of four elements:

1. If a soil consists of more than one stratum, from the second stratum downwards, every horizon designation starts with the **number of the stratum**. The first stratum does not receive such a number.

2. The next is the **master symbol**, which is a capital letter indicating the major characteristics of the horizon.

3. The master symbol may be followed by one or more lowercase letters, called **suffixes**.

4. If two or more horizons have an identical combination of master symbol and suffixes, they have to be differentiated using numbers.

In some soils, transitional horizons exist. There are two kinds of transitional horizons: those with properties of two horizons *superimposed* and those with the two properties separate.

For horizons dominated by properties of one master horizon but having subordinate properties of another, two master symbols are used, such as AB, EB, BE and BC, the dominant symbol first.

Horizons, in which distinct parts have recognizable properties of two kinds of master horizons, are indicated as above, but the two capital letters are separated by a virgule (/), such as A/C, B/E, B/C and C/R. In this case, contestants have to describe the dominant part, only.

5.1. WORLD REFERENCE BASE FOR SOIL RESOURCES (2022)

HORIZON DESIGNATION

Task on the scoresheet: Indicate the full horizon designation. For the master symbol use Table 22 and for the suffixes Table 23. A maximum of three suffixes may be used if applicable.

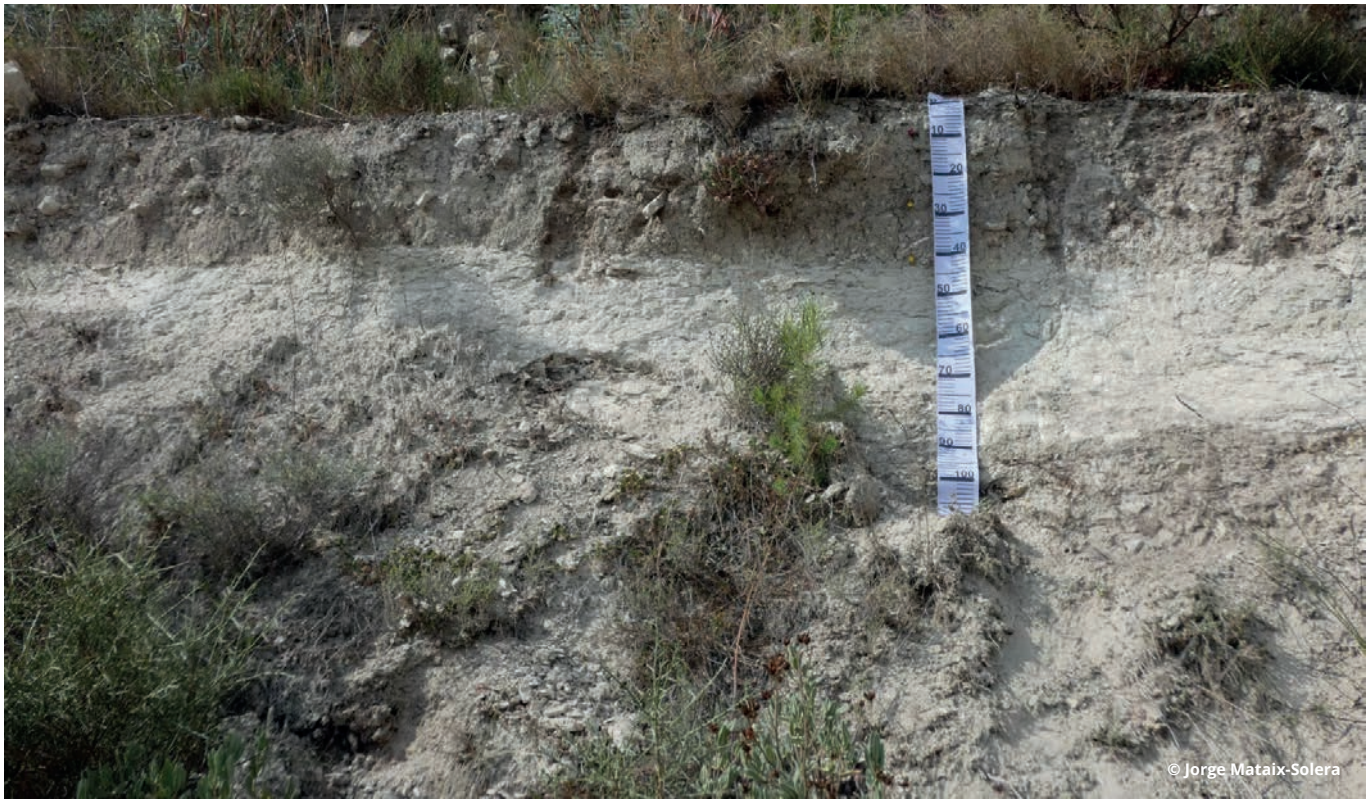


Table 22: Master symbols for horizons in WRB (IUSS Working Group WRB, 2022, Table 10.1, modified)

Symbol	Criteria
	Mineral horizons
A	Mineral horizon at the mineral soil surface or buried; contains organic matter that has at least partly been modified in situ; soil structure and/or structural elements created by agricultural practices in ≥ 50% (by volume, related to the fine earth); usually a darker color than underlying horizons.
E	Mineral horizon, at or near the mineral soil surface, characterized by a loss of one or more of the following: Fe, Al, clay minerals, organic matter; usually lighter in color (higher value and/or lower chroma) than the overlying A and underlying B.
B	Mineral horizon that has (at least originally) formed below an A or E horizon; rock structure, if present, in < 50% (by volume, related to the fine earth); one or more of the following processes of soil formation: • formation of soil aggregate structure • formation of clay minerals and/or oxides • accumulation by illuviation processes of one or more of the following: Fe, Al, clay minerals, organic matter, silica, carbonates, gypsum • removal of carbonates or gypsum.
C	Mineral layer, unconsolidated (can be cut with a spade when moist) or consolidated and more fractured than the R layer; may be partly chemically weathered, otherwise little affected by pedogenic processes.
R	Consolidated rock that cannot be cut with a spade; fractures, if present, occupy < 10% (by volume, related to the whole soil); not resulting from the cementation of a soil horizon.
	Organic horizons
O	Organic horizon (≥ 20% (by mass) organic carbon), not forming part of a litter layer; O horizons are not saturated with water for prolonged periods.
H	Organic horizon (≥ 20% (by mass) organic carbon), not forming part of a litter layer; H horizons are saturated with water for prolonged periods or have been drained.

Table 23: Suffixes for horizons in WRB (IUSS Working Group WRB, 2022, Table 10.2, modified)

Suffix	Short description	Combination with
c	Concretions or nodules (only used if following another suffix that indicates the accumulated substance; by carbonates, gypsum, silica, Fe and Al oxides)	
g	Accumulation of Fe oxides predominantly inside soil aggregates or loss of Fe by lateral subsurface flow (as in stagnic properties)	A, B, C E
i	Slickensides and/or wedge-shaped aggregates	B
k	Accumulation of pedogenetic carbonates	H, O, A, E, B, C
m	Cementation by pedogenetic processes (only used if following another suffix that indicates the accumulated substance; by carbonates, gypsum, silica, soluble salts, Fe and Al oxides)	
l	Accumulation of Fe in reduced form by upward-moving capillary water with subsequent oxidation, predominantly at soil aggregate surfaces (as in gleyic properties)	H, A, B, C
p	Modification by cultivation (e.g. ploughing); mineral layers are designed A, even if they belonged to another layer before cultivation	H, O, A
r	Strong reduction (as in gleyic properties)	A, E, B, C
t	Illuvial accumulation of clay minerals (with or without associated oxides)	B, C
w	Formation of soil aggregate structure and/or oxides and/or clay minerals	B
α	Primary carbonates (in R layers related to the rock, in all others related to the fine earth) and no prominent accumulation of secondary carbonates	H, A, E, B, C, R
τ	Human-transported natural material	H, O, A, E, B, C,

SOIL CLASSIFICATION

Diagnostic Horizons / Properties / Materials: Indicate with a cross (X) all diagnostic horizons / properties / materials that apply to the profile within the specified judging depth.

Reference Soil Group: Indicate with a cross (X) only one Reference Soil Group (RSG). RSGs of buried soils, if present, are not considered.

Principal Qualifiers: Indicate with a cross (X) one, two, or three principal qualifiers that apply to the profile within the specified judging depth. If more than three apply, indicate only the three most important ones according to the qualifier sequence.

5.2. SOIL TAXONOMY (2022)

HORIZON DESIGNATION

Task on the scoresheet: Indicate the full horizon designation. For the master symbol use Table 24 and for the suffixes Table 25. A maximum of three suffixes may be used if applicable.

Table 24: Master symbols for horizons in ST (Soil Survey Staff, 2024, 4-1 to 4-3, modified)

Symbol	Criteria
Mineral horizons	
A	Mineral soil material, formed at the surface or below an O horizon, little remnant rock structure; one or more of the following: • accumulation of organic matter • properties resulting from cultivation • morphology resulting from surficial processes; usually a darker color than underlying horizons.
E	Mineral horizon, at or near the soil surface, characterized by a loss of one or more of the following: Fe, Al, clay minerals, organic matter; usually lighter in color (higher value and/or lower chroma) than the overlying A and underlying B.
B	Mineral horizon that has (at least originally) formed below an A or E horizon; little or no rock structure; one or more of the following processes of soil formation: • formation of soil aggregate structure • formation of clay minerals and/or oxides • accumulation by illuviation processes of one or more of the following: Fe, Al, clay minerals, organic matter, silica, carbonates, gypsum • removal of carbonates or gypsum.
C	Mineral soil material; soft or weakly to moderately cemented or highly cracked bedrock (can be cut with a spade when moist); may be partly chemically weathered, otherwise little affected by pedogenic processes.
R	Hard bedrock (continuous, coherent, at least strongly cemented) that cannot be cut with a spade; not resulting from the cementation of a soil horizon.
Organic horizons	
O	Organic horizon (≥ 12% (by mass) organic carbon), not forming part of freshly fallen plant litter.

Table 25: Suffixes for horizons in ST (Soil Survey Staff, 2024, 4-3 to 4-6, modified)

Suffix	Short description
c	Concretions or nodules (by Fe and Al oxides)
g	Strong gleying
k	Accumulation of pedogenetic carbonates, < 50% (by volume)
kk	Accumulation of pedogenetic carbonates, soil fabric is plugged, ≥ 50% (by volume)
m	Cementation by pedogenetic processes (by carbonates, gypsum, silica, soluble salts, Fe and Al oxides)
p	Ploughing or other human disturbance
ss	Slickensides
t	Illuvial accumulation of clay minerals (with or without associated oxides)
w	Development of color or structure
^	Human-transported materials

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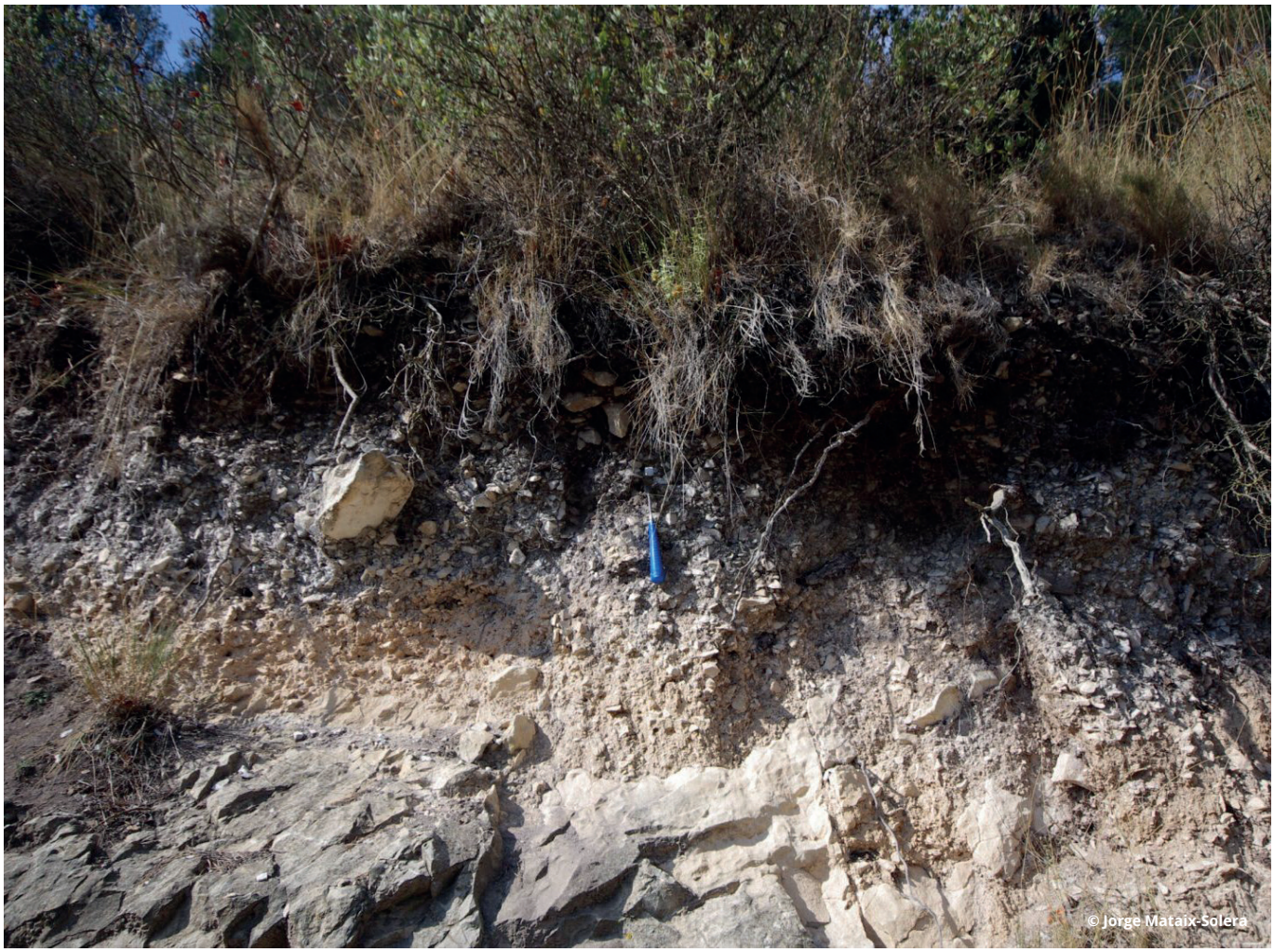
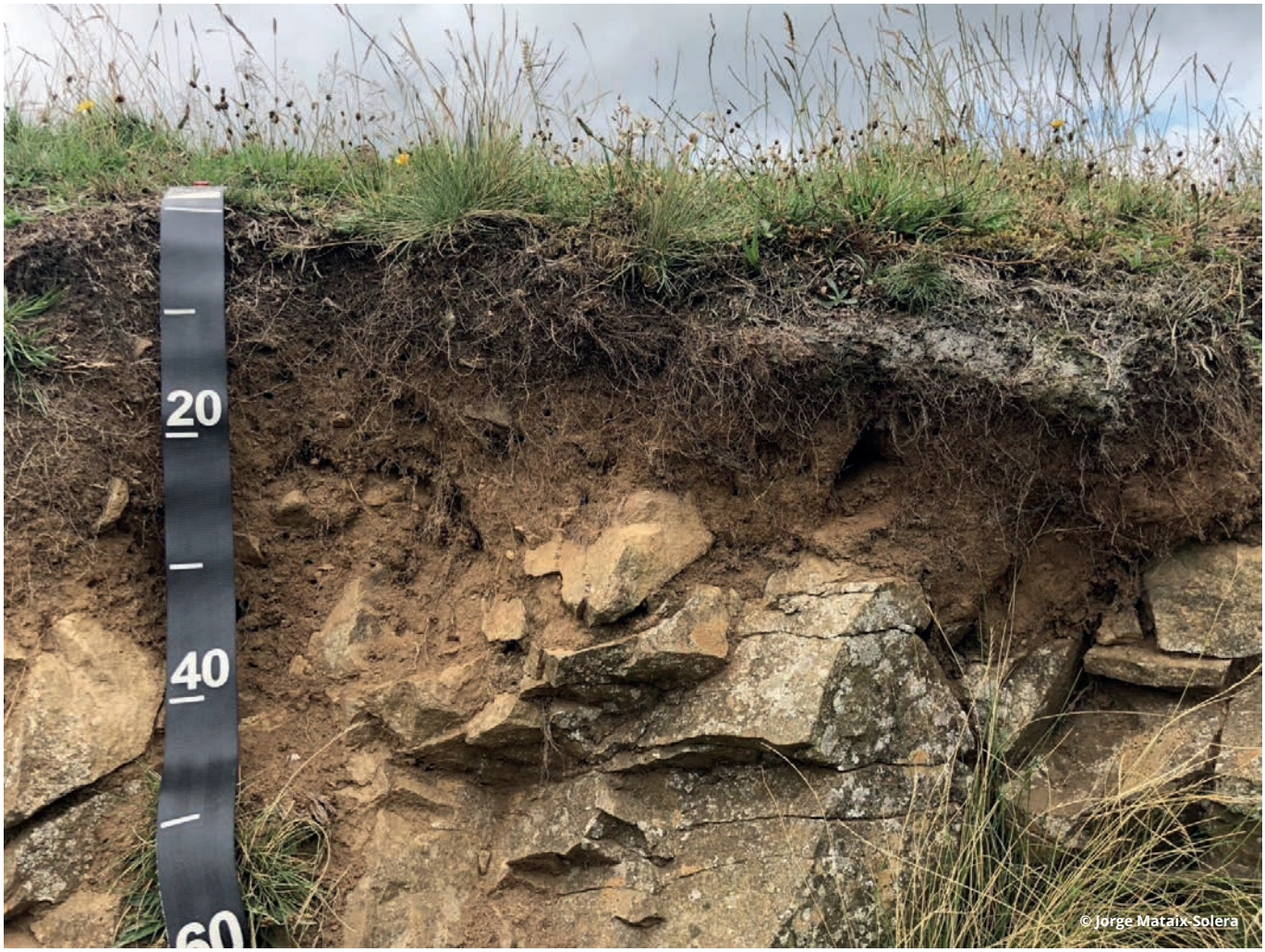


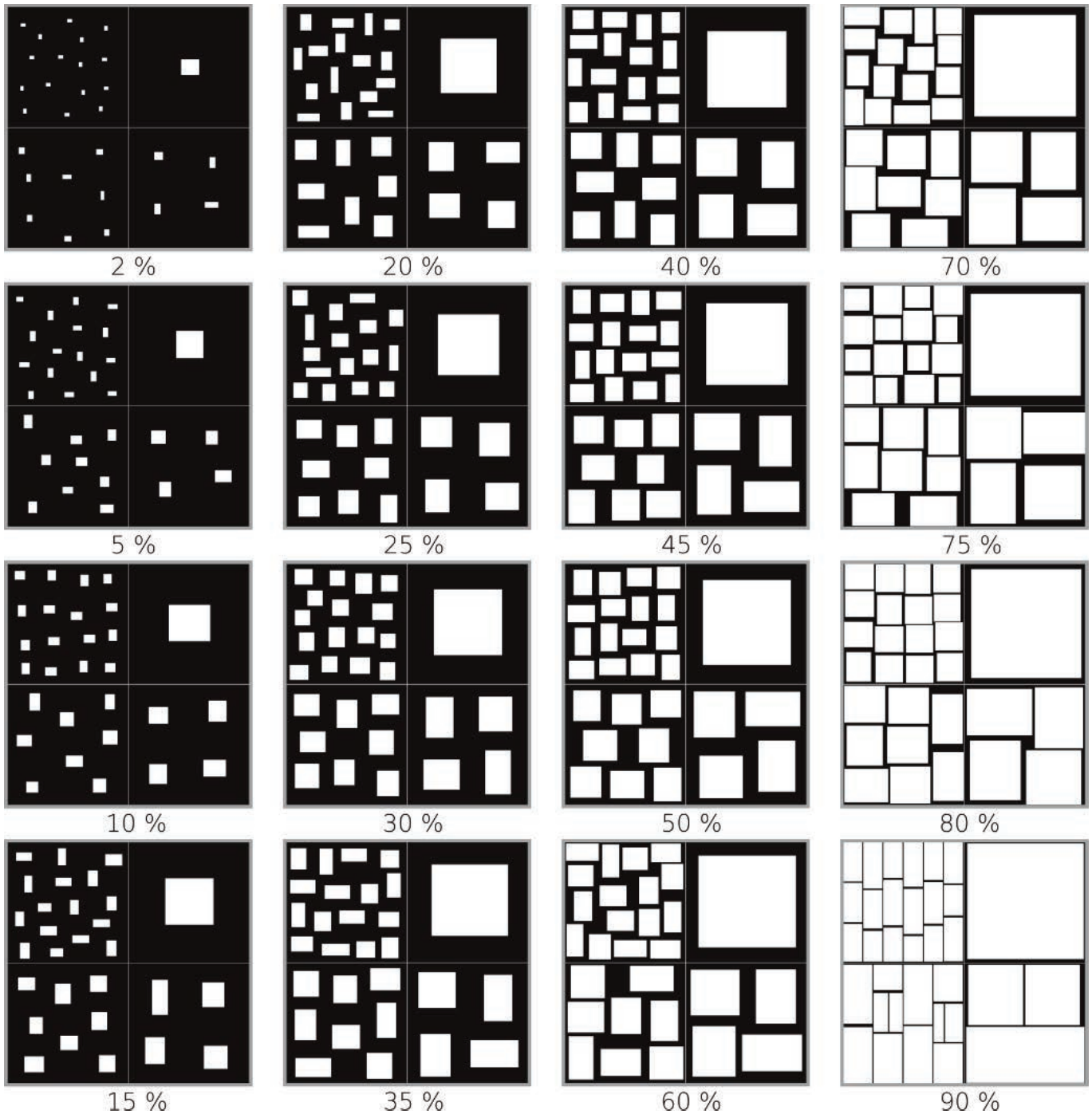
<table>
<tr><th colspan="2">SITE CHARACTERISTICS</th></tr>
<tr><td>Land use</td><td rowspan="10">Only one answer for each is correct. For the correct answer, 1 point will be awarded. For an incorrect answer, 0 points will be awarded.</td></tr>
<tr><td>Slope position</td></tr>
<tr><td>Slope gradient</td></tr>
<tr><td>Erosion category</td></tr>
<tr><td>Erosion degree</td></tr>
<tr><td>Surface stoniness</td></tr>
<tr><td>Rock outcrops</td></tr>
<tr><td>Surface unevenness</td></tr>
<tr><td>Litter layer: area covered</td></tr>
<tr><td>Litter layer: average thick.</td></tr>
<tr><td>PROFILE DESCRIPTION</td><td></td></tr>
<tr><td>Horizon boundary lower depth</td><td>The threshold of correct lower depth readings depend on the distinctness of the boundary. Abrupt/Clear: ±5 cm, Gradual/Diffuse: ±10 cm. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.</td></tr>
<tr><td>Horizon boundary distinctness</td><td>Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.</td></tr>
<tr><td>Horizon boundary shape (topography)</td><td>Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.</td></tr>
<tr><td>Texture class</td><td>Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.</td></tr>
<tr><td>Texture clay %</td><td>A scaled range for correct answers compared to values obtained from laboratory data will be used according to:
<table>
<tr><th>Actual clay content</th><th>Range for grading 2 points</th><th>Range for grading 1 point</th></tr>
<tr><td>≤ 20 %</td><td>± 3%</td><td>± 6%</td></tr>
<tr><td>20 - 40 %</td><td>± 4%</td><td>± 8%</td></tr>
<tr><td>> 40 %</td><td>± 5%</td><td>± 10%</td></tr>
</table></td></tr>
<tr><td>Texture sand %</td><td>A scaled range for correct answers compared to values obtained from laboratory data will be used according to:
<table>
<tr><th>Actual sand content</th><th>Range for grading 2 points</th><th>Range for grading 1 point</th></tr>
<tr><td>≤ 20 %</td><td>± 3%</td><td>± 6%</td></tr>
<tr><td>20 - 40 %</td><td>± 4%</td><td>± 8%</td></tr>
<tr><td>> 40 %</td><td>± 5%</td><td>± 10%</td></tr>
</table></td></tr>
<tr><td>Rock fragments (coarse fragments) and artefacts</td><td>A scaled range for correct answers compared to the values estimated by the organizers will be used. 2 points will be awarded if the answer is ± 5% correct, 1 point if the answer is ± 10% correct. If rock fragments are absent, only 0 is the correct answer.</td></tr>
</table>

Rock fragments: weighted average	The points are awarded if the calculations based on the rock fragment contents and the horizon thicknesses estimated by the contestants are correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.
Structure type	Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.
Structure grade	Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.
Carbonate content	Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.
Secondary carbonates: types	If only one type is present, 2 points will be awarded for the correct answer and 0 points for an incorrect answer. If more types are present, 1 point will be awarded for each correct answer, maximum 2. In the latter case, for an incorrect answer -1 point will be awarded. The overall score cannot be lower than 0.
Secondary carbonates: percentage	1 point will be awarded if the answer is ± 5% correct, compared to the value estimated by the organizers. If secondary carbonates are absent, only 0 is the correct answer.
Soil Color hue	Only one answer is correct. For the correct answer, 1 point will be awarded. For an incorrect answer, 0 points will be awarded.
Soil color value	For the correct answer, 2 points will be awarded. If the answer is lower or higher than the correct one by 1 value category, 1 point will be awarded. If the answer is lower or higher than the correct one by 2 or more value categories, 0 points will be awarded.
Soil color chroma	For the correct answer, 2 points will be awarded. If the answer is lower or higher than the correct one by 1 chroma category, 1 point will be awarded. If the answer is lower or higher than the correct one by 2 or more chroma categories, 0 points will be awarded.
Redox features: Location of oximorphic features	Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.
Redox features: Location of reductimorphic features	Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.
Redox features: oximorphic inner: percentage	1 point will be awarded if the answer is ± 5% correct, compared to the value estimated by the organizers. If oximorphic features are absent, only 0 is the correct answer.
Redox features: oximorphic outer: percentage	1 point will be awarded if the answer is ± 5% correct, compared to the value estimated by the organizers. If oximorphic features are absent, only 0 is the correct answer.
Redox features: reducti-morphic inner: percentage	1 point will be awarded if the answer is ± 5% correct, compared to the value estimated by the organizers. If reductimorphic features are absent, only 0 is the correct answer.
Redox features: reducti-morphic outer: percentage	1 point will be awarded if the answer is ± 5% correct, compared to the value estimated by the organizers. If rductimorphic features are absent, only 0 is the correct answer.
Aggregate surfaces: type	Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.
Aggregate surfaces: percentage	1 point will be awarded if the answer is ± 5% correct, compared to the value estimated by the organizers.
Parent material	Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.

SOIL CHARACTERISTICS AND EVALUATION	
Rooting depth	Only one answer is correct. For the correct answer, 3 points will be awarded. For an incorrect answer, 0 points will be awarded.
Type of restrictive layer	
Hydraulic conductivity	
AWHC	
Drainage class	
Cereal production	
Forest	
Camp site	
HORIZON DESIGNATIONS - WRB AND ST, EACH	
Stratum	Only one answer is correct. For the correct answer, 1 point will be awarded. For an incorrect answer, 0 points will be awarded.
Master symbol	Only one answer is correct. For the correct answer, 2 points will be awarded. For an incorrect answer, 0 points will be awarded.
Suffix(es)	Multiple suffixes might be correct. The maximum number of indicated suffixes is three. If all of the required suffixes are indicated, 3 points will be awarded. The following examples illustrate the case when an incorrect answer is given or suffix/suffixes is/are missing.
Number	Only one answer is correct. For the correct answer, 1 point will be awarded. For an incorrect answer, 0 points will be awarded.
DIAGNOSTICS AND SOIL CLASSIFICATION - WRB	
Diagnostic horizons	Multiple answers might be correct. If correct horizons are marked, 10 points will be awarded for each one. If incorrect horizons are marked, -10 points will be awarded. The overall score cannot be lower than 0.
Diagnostic properties	Multiple answers might be correct. If correct properties are marked, 5 points will be awarded for each one. If incorrect properties are marked, -5 points will be awarded. The overall score cannot be lower than 0.
Diagnostic materials	Multiple answers might be correct. If correct materials are marked, 5 points will be awarded for each one. If incorrect materials are marked, -5 points will be awarded. The overall score cannot be lower than 0.
RSG	Only one answer is correct. If the correct RSG is marked, 15 points will be awarded. If an incorrect RSG is marked, 0 points will be awarded.
Principal qualifiers	Multiple answers might be correct. If correct principal qualifiers are marked, 5 points will be awarded for each one. If incorrect principal qualifiers are marked, -5 points will be awarded for each one. The overall score cannot be lower than 0. If more than three principal qualifiers apply, only the three most important ones according to the qualifier sequence will be awarded. For additional correct qualifiers, no points will be awarded nor a deduction will be made.

DIAGNOSTICS AND SOIL CLASSIFICATION - SOIL TAXONOMY	
Epipedon	Only one answer is correct. If the correct epipedon is marked, 10 points will be awarded. If an incorrect epipedon is marked, 0 points will be awarded.
Subsurface horizons	Multiple answers might be correct. If correct horizons are marked, 5 points will be awarded for each one. If incorrect horizons are marked, -5 points will be awarded. The overall score cannot be lower than 0.
Diagnostic characteristics	Multiple answers might be correct. If correct characteristics are marked, 5 points will be awarded for each one. If incorrect characteristics are marked, -5 points will be awarded. The overall score cannot be lower than 0.
Order	Only one answer is correct. If the correct order is marked, 10 points will be awarded. If an incorrect order is marked, 0 points will be awarded.
Suborder	Only one answer is correct. If the correct suborder is marked, 5 points will be awarded. If an incorrect suborder is marked, 0 points will be awarded.
Great Group	Only one answer is correct. If the correct great group is marked, 5 points will be awarded. If an incorrect great group is marked, 0 points will be awarded.
Subgroup	Only one answer is correct. If the correct subgroup is marked, 5 points will be awarded. If an incorrect subgroup is marked, 0 points will be awarded

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