Field Book for Describing and Sampling Soils

Changes to 3rd Printing

Version 3.0

Reprint 2021

National Soil Survey Center
Natural Resources Conservation Service
U.S. Department of Agriculture
Lincoln, Nebraska

THIS DOCUMENT

The "Field Book for Describing and Sampling Soils, Version 3.0" was first printed in 2012. Due to high demand, it was reprinted in 2016 and again in 2021.

This document lists changes between the second (2016) and third (2021) printings. The changes are primarily errata but, in some cases, replace material that became outdated. The third printing most accurately represents the official material as of 2021.

The third printing is a corrected reprint, not an update.

PAGE 1–4

Second Printing

See the "Geomorphic Description Section" for complete lists (p. 3–1).

Third Printing

See the "Geomorphic Description System" for complete lists (p. 3–1).

PAGE 1–11

Second Printing

Subaqeous Drainage—Free water is above the soil surface.

Third Printing

Subaqueous Drainage—Free water is above the soil surface.

PAGES 1–11 AND 2–101

Second Printing

The soils have a peraquic soil moisture regime (proposed 2010; Soil Survey Staff revision online at soils.usda.gov/technical/manual/proposed changes.html).

Third Printing

The soils have a peraquic soil moisture regime.

PAGE 1–18

Second Printing

Describe the nature of the unconsolidated material (regolith) in which the soil is formed.

Third Printing

Describe the nature of the unconsolidated material (regolith) in which the soil is formed (e.g., till).

PAGE 1–21: FOOTNOTE 2

Second Printing

Use the most precise term for the in situ material.

Third Printing

Use the most precise term possible for the in situ material.

PAGES 1–22 AND 5–1

Second Printing

IGNEOUS—INTRUSIVE			
anorthosite	ANO	pyroxenite	PYX
diabase	DIA	quartzite	QZT
diorite	DIO	quartz-diorite	QZD
gabbro	GAB	quartz-monzonite	QZM
granite	GRA	syenite	SYE
granitoid 2	GRT	syenodiorite	SYD
granodiorite	GRD	tonalite	TON
monzonite	MON	ultramafic rock 2	UMU
peridotite	PER		

Third Printing

IGNEOUS—INTRUSIVE			
anorthosite	ANO	peridotite	PER
diabase	DIA	pyroxenite	PYX
diorite	DIO	quartz-diorite	QZD
gabbro	GAB	quartz-monzonite	QZM
granite	GRA	syenite	SYE
granitoid 2	GRT	syenodiorite	SYD
granodiorite	GRD	tonalite	TON
monzonite	MON	ultramafic rock 2	UMU

PAGE 2–6

Second Printing

d) (for submerged soil) the same as b) but refers to the water/soil contact and extends out from shore to the limit of emergent rooted plants;

Third Printing

d) (for submerged soil) the same as b) but refers to the water/soil contact and extends out from the shore to the limit of rooted plants;

PAGE 2–8

Second Printing

Concentration or Ped and Void Surface Feature; e.g., carbonate mass, clay film, and organic

Third Printing

Concentration or Ped and Void Surface Feature; e.g., carbonate mass, clay film, and organic coat

PAGE 2–24

Second Printing

(<2 mm)

Third Printing

(>0.25 to <2mm)

PAGE 2–27

Second Printing

Lining pores *(see graphic p. 2-34)*	LPO

Third Printing

Lining pores *(see Coats/Films graphic p. 2-34)*	LPO

PAGE 2–39

Second Printing

Extremely Bouldery	XBY	BYX	≥35% but <60% boulders

Third Printing

Very Bouldery	VBY	BYV	≥35% but <60% boulders
Extremely Bouldery	XBY	BYX	≥60% but <90% boulders

PAGE 2–41

Second Printing

(COMPOSITIONAL) TEXTURE MODIFIERS 1, 2—Compositional adjectives.

Third Printing

(COMPOSITIONAL) TEXTURE MODIFIERS 1, 2—Compositional adjectives (e.g., ashy silt loam)

Second Printing

LIMNIC MATERIALS (used only with Histosols)

Third Printing

LIMNIC MATERIALS

PAGE 2–43

Second Printing

Ice [4, 5] (permanent, subsurface)	ICE
Material [6]	MAT
Water [5] (permanent, subsurface)	W

Third Printing

Ice [5] (permanent, subsurface)	ICE
Water [4] (permanent, subsurface)	W

PAGE 2–44

Second Printing

[5] Used for permanent (nonseasonal), massive, subsurface ice; e.g., a glacic layer; proposed in NASIS.

[6] "Material" is used only in combination with Compositional Texture Modifiers (p. 2–41); e.g. *woody material*; *medial material*. In NASIS, "Cemented Material" denotes any cemented soil material (i.e., *duripan, ortstein, petrocalcic, petroferric, petrogypsic*).

Third Printing

[5] Used for permanent (nonseasonal), massive, subsurface ice.

PAGE 2–65

Second Printing

FLUIDITY [1]		**Use a palmful of soil (squeeze in hand)**
Nonfluid	NF	After full compression, no soil flows through the fingers.
Slightly Fluid	SF	After full compression is exerted, some soil flows through fingers; most remains in the palm.
Mod. Fluid	MF	After full pressure is exerted, most soil flows through fingers; some remains in the palm.
Very Fluid	VF	Under very gentle pressure, most soil flows through the fingers as a slightly viscous fluid; very little or no residue remains in the palm of the hand.

Third Printing

FLUIDITY [1]		**Use a palmful of soil (squeeze in hand)**
Nonfluid	NF	After full compression, no soil flows through the fingers. n value = 0
Slightly Fluid	SF	After full compression is exerted, some soil flows through fingers; most remains in the palm. n value >0 to <0.7
Mod. Fluid	MF	After full pressure is exerted, most soil flows through fingers; some remains in the palm. n value >0.7 to <1.0
Very Fluid	VF	Under very gentle pressure, most soil flows through the fingers as a slightly viscous fluid; very little or no residue remains in the palm of the hand. n value >1.0

PAGE 3–1

Second Printing

(Version 4.2—03/01/2012)

Third Printing

(Version 5.0—08/14/2017)

PAGES 3–15 AND 3–32; LANDFORMS

Second Printing

ledge	LE

Third Printing

ledge (also Micro)	LE

PAGE 3–31; LANDSCAPES

Second Printing

plateau	PT

Third Printing

plateau (also LF)	PT

IGNEOUS ROCKS CHART

CRYSTALLINE TEXTURE	**KEY MINERAL COMPOSITION**									
	Acidic (≈felsic) Potassium (K) Feldspar > 2/3 of total Feldspar content		*Intermediate* (---) Potassium (K) Feldspar and Plagioclase (Na, Ca) Feldspar in about equal proportions		*Basic* (≈mafic) Plagioclase (Na, Ca) Feldspar > 2/3 of total Feldspar content			*Ultrabasic* (≈ultramafic) Pyroxene and olivine	
PEGMATITIC (very coarse, uneven-sized crystal grains)	*Quartz* granite pegmatite	*No Quartz* syenite pegmatite	*Quartz* ← monzonite-pegmatite	*No Quartz* →	Sodic (Na) Plagioclase *Quartz*	*No Quartz* diorite-pegmatite	Calcic (Ca) Plagioclase gabbro pegmatite	peridotite (mostly olivine)	
PHANERITIC (crystals visible and of nearly equal size)	granite	syenite	quartz monzonite	monzonite	quartz-diorite granodiorite	diorite	gabbro	pyoxenite (mostly pyroxene)	
PORPHYRITIC (relatively few visible crystals within a fine-grained matrix)	granite porphyry	syenite porphyry	quartz monzonite porphyry	monzonite porphyry	quartz-diorite porphyry	diorite porphyry	diabase		
	rhyolite porphyry	trachyte porphyry	quartz-latite porphyry	latite porphyry	dacite porphyry	andesite porphyry	porphyry basalt		
APHANITIC (crystals visible only with magnification) micro [1] crypto [2]	rhyolite	trachyte	quartz latite	latite	dacite	andesite	basalt	} lava [3]	
GLASSY (amorphous: no crystalline structure)	obsidian (and its varieties: perlite, pitchstone, pumice, and scoria) pyroclastics are shown on the Sedimentary and Volcaniclastic Rocks chart				[1] Microcrystalline—crystals visible with ordinary magnification (hand lens, simple microscope) [2] Cryptocrystalline—crystals only visible with SEM [3] Lava – generic name for extrusive flows of nonclastic, aphanitic rocks (rhyolite, andesite, and basalt)				

(Schoeneberger and Wysocki, 1998)

IGNEOUS ROCKS CHART

CRYSTALLINE TEXTURE	KEY MINERAL COMPOSITION							
	Acidic (Felsic)		INTERMEDIATE				Basic (mafic)	Ultrabasic (ultramafic)
	Potassium (K) Feldspar >2/3 of Total Feldspar Content		Potassium (K) Feldspar and Plagioclase (Na, Ca) Feldspar in about equal proportions		Plagioclase (Na, Ca) Feldspar >2/3 of Total Feldspar Content			Pyroxene and Olivine
					Sodic (Na) Plagioclase		Calcic (Ca) Plagioclase	
	Quartz	No Quartz	Quartz	No Quartz	Quartz	No Quartz		
PEGMATITIC [1]	granite pegmatite	syenite pegmatite	← monzonite pegmatite →			diorite pegmatite	gabbro pegmatite	peridotite (mostly olivine)
PHANERITIC [2]	granite	syenite	quartz monzonite	monzonite	quartz-diorite granodiorite	diorite	gabbro	pyroxenite (mostly pyroxene)
PORPHYRITIC [3]	granite porphyry	syenite porphyry	quartz-monzonite porphyry	monzonite porphyry	quartz-diorite porphyry	diorite porphyry	diabase	
	rhyolite porphyry	trachyte porphyry	quartz-latite porphyry	latite porphyry	dacite porphyry	andesite porphyry	basalt porphyry	
APHANITIC [4] **micro**[5] **crypto**[6]	rhyolite	trachyte	quartz latite	latite	dacite	andesite	basalt	} lava [7]
GLASSY [8]	Obsidian (and its varieties: perlite, pitchstone, pumice, scoria) Pyroclastics are shown on the Sedimentary and Volcaniclastic Rocks chart.							

[1] Pegmatitic: Very coarse, uneven-sized crystal grains; 5 to >20 mm
[2] Phaneritic: Crystals discernable by eye or 10X lens; 1-5 mm
[3] Porphyritic: Larger crystals embedded within a fine-grained matrix
[4] Aphanitic: Crystals not visible by eye or 10X lens; <1 mm
[5] Microcrystalline crystals resolvable by optical microscope
[6] Cryptocrystalline crystals resolvable by electron microscope
[7] Lava: Generic name for extrusive flows of non-clastic, aphanitic rocks (rhyolite, andesite, basalt)
[8] Glassy: Noncrystalline or weakly crystalline

METAMORPHIC ROCKS CHART

NONFOLIATED STRUCTURE			*CRUDE ALIGNMENT*	*FOLIATED STRUCTURE (e.g., banded)*			
CONTACT METAMORPHISM			**MECHANICAL METAMORPHISM**	**REGIONAL METAMORPHISM**		**PLUTONIC METAMORPHISM**	
Low Grade	*Medium Grade*	*High Grade*	*Very Low Grade*	*Low Grade*	*Medium Grade*	*High Grade*	*Exteme Grade*
granofels hornfels marble metaquartzite serpentinite soapstone (talc)			crush breccia mylonite <-- metaconglomerate --> <----- metavolcanics ----->	slate	phyllite greenstone	schist amphibolite	gneiss granulite	migmatite

* Not all rock types listed here can be definitively identified in the field (e.g., may require grain counts).
** Not all rock types shown here are available on Bedrock - Kind choice list. They are included here for completeness and as aids to using geologic literature.

(Schoeneberger and Wysocki, 1998)

METAMORPHIC ROCKS CHART

[Not all rock types listed here can be definitively identified in the field (e.g., may require grain counts). Not all rock types shown here are available on Bedrock - Kind choice list. They are included here for completeness and as aids to using geologic literature.]

NONFOLIATED STRUCTURE			***CRUDE ALIGNMENT***	***FOLIATED STRUCTURE (e.g., banded)***				
CONTACT METAMORPHISM			**FAULT ZONE METAMORPHISM**	**REGIONAL METAMORPHISM**			**PLUTONIC METAMORPHISM**	
Low Grade	*Medium Grade*	*High Grade*	*Low Grade*	*Low Grade*		*Medium Grade*	*High Grade*	
granofels hornfels marble metaquartzite serpentinite soapstone (talc)			crush breccia mylonite	slate	phyllite greenstone	schist amphibolite	gneiss granulite	migmatite*
				<----------Metaconglomerate---------->				
				<----------Metavolcanics---------->				
				<----------Metasedimentary---------->				
* Partial melting occurs.								

(Schoeneberger and Wysocki, 1998)

SEDIMENTARY AND VOLCANICLASTIC ROCKS

CLASTIC

Dominant Grain Size

Very Fine	Fine	Medium	Coarse
<----- *(Argillaceous)* ----->		*(Arenaceous)*	*(Rudaceous)*
< 0.002 mm	0.002 - 0.06 mm	0.06 - 2.0 mm	>2.0 mm
<-------- argillite --------> *(more indurated, less laminated and fissile)* <---------- shale ----------> *(laminated, fissile)* <------- mudstone -------> *(nonlaminated, nonfissile)* *(□ equal clay and silt)*		Sandstones (ss): arenite arkose *(mainly feldspar)* glauconitic ss *("greensand")* graywacke *(dark, "dirty" ss)* orthoquartzite *(mainly quartz)*	breccia *(nonvolcanic, angular frags)* conglomerate *(nonvolcanic, rounded frags)*
claystone *(non-laminated, nonfissile)*	siltstone *(nonlaminated, nonfissile)*		

VOLCANICLASTICS *(includes Pyroclastics)*

<---------- ignimbrite ---------->	agglomerate *(rounded frags)*
<---------- tuff ---------->	volcanic breccia *(angular frags)*

<---------- pumice *(specific gravity <1.0; highly vesicular)*---------->
<----- scoria *(specific gravity >2.0; slightly or moderately vesicular)* ------>

NONCLASTIC

Chemical		Biochemical	Organic
Evaporates, Precipitates		**Accretionates**	**Reduzates**
anhydrite *($CaSO_4$)* gypsum *($CaSO_4 \cdot 2H_2O$)* halite *(NaCl)*	**CARBONATE ROCKS** Limestones (ls) (>50% calcite) chemical types caliche travertine tufa altered types dolomite *(>50% calcite + dolomite)* phosphatic limestone	accretionary types biostromal ls organic reef pelagic ls (chalk) bio-clastic types coquina oolithic ls lithographic ls	black shale *(organics and fine sediments)* bituminous ls bog iron ores coal

OTHER NONCLASTIC ROCKS

Siliceous rocks (SiO_2 dominated):
chert (jasper, chalcedony, opal)
diatomite
rock phosphate
iron-bearing rocks (Fe-SiO_2 dominated)

(Schoeneberger and Wysocki, 2000)

SEDIMENTARY AND VOLCANICLASTIC ROCKS

CLASTIC

Dominant Grain Size

Very Fine	Fine	Medium	Coarse
<----- *(Argillaceous)* ----->		*(Arenaceous)*	*(Rudaceous)*
< 0.002 mm	0.002 - 0.06 mm	0.06 - 2.0 mm	>2.0 mm
<-------- argillite --------> *(more indurated, less laminated and fissile)* <---------- shale ----------> *(laminated, fissile)* <------- mudstone -------> *(nonlaminated, nonfissile)* *(≈ equal clay and silt)*		Sandstones (ss): arenite, arkose *(mainly feldspar)*, glauconitic ss *("greensand")*, graywacke *(dark, "dirty" ss)*, orthoquartzite *(mainly quartz)*	breccia *(nonvolcanic, angular frags)*, conglomerate *(nonvolcanic, rounded frags)*
claystone *(non-laminated, nonfissile)*	siltstone *(nonlaminated, nonfissile)*		

VOLCANICLASTICS *(includes Pyroclastics)*

<---------- ignimbrite ----------> (mainly pumice frags; consolidated pyroclastic flows)	agglomerate *(rounded frags)*
<---------- tuff ----------> (consolidate volcanic ash, tephra)	volcanic breccia *(angular frags)*
<---------- pumice *(specific gravity <1.0; highly vesicular)*---------->	
<----- scoria *(specific gravity >2.0; slightly or moderately vesicular)* ----->	

NONCLASTIC

Chemical		Biochemical	Organic
Evaporates, Precipitates		**Accretionates**	**Reduzates**
anhydrite *($CaSO_4$)*, gypsum *($CaSO_4 \cdot 2H_2O$)*, halite *(NaCl)*	**CARBONATE ROCKS** Limestones (ls) (>50% calcite)		
	chemical types: caliche, travertine, tufa	accretionary types: biostromal ls, organic reef, pelagic ls (chalk)	black shale *(organics and fine sediments)*, bituminous ls, bog iron ores, coal
		bio-clastic types: coquina, oolithic ls, lithographic ls	
	dolomite (>50% $CaMg(CO_3)$), phosphatic limestone		

OTHER NONCLASTIC ROCKS

Siliceous rocks (Silica dominated): chert (jasper, chalcedony, opal); diatomite
Rock phosphate
Iron-bearing rocks (Fe-SiO_2 dominated): jaspilite, specular hematite, magnetite

(Schoeneberger and Wysocki, 2000)

PAGE 7–14

Second Printing

(Doerr et al., 2000)
(Robichand and Miller, 1999)
(Robichand et al., 2008)

Third Printing

(Doerr et al., 2006)
(Robichaud and Miller, 1999)
(Robichaud et al., 2008)

PAGE 7–15

Second Printing

2) Use an eyedropper or plastic squeeze bottle to randomly place 5 drops of distilled water (approximately 5 mm in diameter) from a 1-cm height onto the prepared surface.

Modified from Robichand, 2008

Third Printing

2) Use an eyedropper or plastic squeeze bottle to randomly place 5 drops of distilled water (each drop approximately 5 mm in diameter) from a 1-cm height onto the prepared surface.

Modified from Robichaud, 2008

PAGE 8–2

Second Printing

It is advisable to subsample soil horizons about 50 cm thick.

Third Printing

It is advisable to subsample soil horizons >50 cm thick.