

Addendum to [the World Reference Base for Soil Resources](#)

Guidelines for constructing small-scale map legends using the World Reference Base for Soil Resources

January, 2010

Guidelines for constructing small-scale map legends using the World Reference Base for Soil Resources

Introduction

In this addendum to WRB 2006, first update 2007, guidelines are provided to construct map units (or soil typological units) and map legends for scales of 1:250 000 and smaller. For terms and definitions in these guidelines the user is referred to the above publication, which can be downloaded from the WRB website: http://www.fao.org/ag/agl/agll/wrb/doc/wrb2007_corr.pdf.

When classifying soils, the WRB is capable of indicating most of the soil's properties, and in most cases the result is a quite satisfactory and informative soil name. However, when generalization is required, e.g. in mapping, important information may not show, depending on how the generalization is carried out. Although WRB was not primarily designed to serve mapping purposes, it is increasingly used for that. This addendum has been developed to serve the need for small-scale mapping.

In the above-mentioned WRB publication it is suggested to use for small-scale maps the prefix qualifiers only and for large-scale maps additional suffix qualifiers. If this approach is taken with the current configuration of the qualifiers, important information on certain soil characteristics may not be revealed for small-scale maps. For example, the occurrence of clay skins (Cutanic) is recognized at prefix level, and, when generalizing, Luvisols (and related soils) become Cutanic Luvisols or Cutanic other soils, which for temperate and subtropical regions does not give satisfactory differentiation. Similarly, Rhodic in Ferralsols and Nitisols, and Xanthic in Ferralsols, important qualifiers to indicate their environmental setting and geological relationship, are suffix qualifiers, yielding in generalizations only Haplic Ferralsols and Nitisols.

These guidelines are based on the following considerations:

- The soil units and their ranking in the FAO-UNESCO Legend and Revised Legend of the Soil Map of the World (SMW);
- The occurrence and significance of soil properties in other classification systems;
- The relevance of differentiation characteristics for environmental and management functions;
- The availability of soil information (legacy and modern);

- The mappability of soil characteristics at scales of 1:250 000 and smaller.

Intergrade qualifiers are excluded from the map unit qualifier list once the RSG is passed in the Key, unless a specific exclusion is made or the feature is considered to be very important. All qualifiers have been taken into account, regardless whether they are prefix or suffix qualifiers for classification purposes. It must be emphasized that no new definitions and no new qualifiers are introduced; only the ones that are listed in the above-mentioned WRB publication will be used. However, in order to obtain consistent lists, the obligatory "Endo-" specifier has been removed in some cases.

Below, for every Reference Soil Group, the qualifiers are given that can be used to construct small-scale map units and map legends. They are divided into lists of main map unit qualifiers and optional map unit qualifiers. The main map unit qualifiers are ranked and have to be used in the given order. The optional map unit qualifiers are listed alphabetically and may be added according to the need of the user. Some of the optional map unit qualifiers may not be mappable on the scales under consideration.

The following rules apply:

- A map unit consists either of the dominant soil only or of the dominant soil plus a co-dominant soil or one or more associated soils; dominant soils represent 50% or more of the soil cover, co-dominant soils 25% or more, and associated soils are mentioned only if they represent 5% or more of the soil cover or are of high relevance in the landscape ecology; instead of one dominant soil, a combination of at least two co-dominant soils is also possible; if co-dominant or associated soils are indicated, the words "dominant:", "co-dominant:" and "associated:" are written before the name of the soil; the soils are separated by semicolons;
- The number of qualifiers specified below refers to the dominant soil; for co-dominant or associated soils, smaller numbers of qualifiers (or even no qualifier) may be appropriate;
- For map scales of 1 : 5 000 000 and smaller, either the Reference Soil Group (RSG) name or the RSG name plus the first applying qualifier of the main list is used; the qualifier is placed before the RSG name;
- For map scales from 1 : 1 000 000 to 1 : 5 000 000, the RSG name plus the first two applying qualifiers of the main list is used; the qualifiers are placed before the RSG name; the first applying qualifier stands closest to the RSG name;
- For map scales from 1 : 250 000 to 1 : 1 000 000, the RSG name plus the first three applying qualifiers of the main list is used; the qualifiers are placed before the RSG name; the first applying

qualifier stands closest to the RSG name, the second one stands in the middle;

- Additional qualifiers of the main list or qualifiers of the optional list may be used in brackets behind the RSG name; if two or more qualifiers behind the RSG are used, the following rules apply: (a) the qualifiers are separated by commas, (b) the additional qualifiers from the main list are placed first and out of them the first applying qualifier stands first, (c) the sequence of the qualifiers from the optional list is according to the preference of the soil scientist who makes the map;
- In case two or more main map unit qualifiers are listed separated by a slash (/), only the dominant one is used;
- If there are less qualifiers applying than described above, the smaller number is used;
- Redundant qualifiers (the characteristics of which are included in a previously used qualifier) are not added; the qualifier Haplic cannot be used in combination with other qualifiers before the RSG name.
- The use of the specifiers Epi- (the qualifier applies only between 0 and 50 cm from the mineral soil surface) and Endo- (the qualifier applies only between 50 and 100 cm from the mineral soil surface) is encouraged, where applicable.

These guidelines are based on the understanding that satisfactory (quality) data are necessary to determine the elements of the map units.

At the end of this document four examples are given how to construct map unit names for map legends at different scales and increasing level of detail.

HISTOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Cryic Thionic Folic Fibric/Hemic/Sapric Technic Hyperskeletal/Leptic Vitric/Andic Dystric/Eutric Rheic/Ombric	Alcalic Calcaric Calcic Drainic Floatic Gelic Glacic Lignic Limnic Novic Ornithic Petrogleyic Placic Salic Skeletic Sodc Subaquatic Tidalic Toxic Transportic Turbic

ANTHROSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Hydragric/Irragric/Terric/Plaggic/Hortic Dystric/Eutric	Alcalic Arenic Clayic Escalic Ferralic Fluvic Gleyic Novic Oxyaquic Regic Salic Siltic Sodc Spodic Stagnic Technic

TECHNOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Ekranic Linc Urbic/Spolic/Garbic Cryic Toxic Dystric/Eutric	Acric Alic Arenic Calcaric Clayic Densic Drainic Fluvic Folic Gleyic Histic Humic Leptic Lixic Luvic Mollic Novic Oxyaquic Reductic Siltic Skeletic Stagnic Umbric Vitric

CRYOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Glacic Turbic Folic/Histic Hyperskeletal/Leptic Mollic/Umbric Spodic Reductaquic/Oxyaquic Haplic	Arenic Aridic Calcaric Calcic Cambic Clayic Drainic Dystric Eutric Gypsiric Natric Novic Ornithic Salic Siltic Skeletic Thixotropic Transportic Vitric

LEPTOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Nudilithic/Lithic Hyperskeletal Rendzic Folic/Histic Mollic/Umbric Dystric/Eutric	Andic Aridic Brunic Calcaric Cambic Drainic Gelic Gleyic Greyic Gypsic Humic Novic Ornithic Oxyaquic Placic Protothionic Salic Skeletic Sodic Stagnic Technic Tephric Vertic Vitric Yermic

VERTISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Sodic Salic Gypsic Petroduric Petrocalcic/Calcic Pellic Chromic Haplic	Albic Calcaric Duric Endoleptic Ferric Gleyic Grumic Gypsic Humic Hypereutric Hyposalic Hyposodic Manganiferrous Mazic Mesotrophic Mollic Novic Stagnic Technic Thionic

FLUVISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Subaquatic/Tidalic Thionic Skeletic Salic Gleyic Stagnic Folic/Histic Mollic/Umbric Calcaric Dystric/Eutric	Anthric Arenic Aridic Calcic Clayic Densic Drainic Gelic Greyic Gypsic Gypsiric Humic Limnic Oxyaquic Petrogleyic Siltic Sodc Takyric Technic Tephric Transportic Yermic

SOLONETZ

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Gleyic Stagnic Mollic Salic Gypsic Petrocalcic/Calcic Haplic	Abruptic Albic Arenic Aridic Clayic Colluvic Duric Glossalbic Gypsic Humic Magnesic Novic Oxyaquic Petrocalcic Ruptic Siltic Takyric Technic Transportic Vertic Yermic

SOLONCHAKS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Petrosalic	Aceric
Gleyic	Arenic
Stagnic	Aridic
Mollic	Carbonatic
Gypsic	Clayic
Duric	Chloridic
Calcic	Densic
Sodic	Drainic
Haplic	Folic
	Gelic
	Histic
	Hypersalic
	Novic
	Oxyaquic
	Puffic
	Siltic
	Sulphatic
	Takyric
	Technic
	Transportic
	Vertic
	Yermic

GLEYSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Thionic Folic/Histic Mollic/Umbric Pisoplinthic/Plinthic Gypsic Calcic/Calcaric Dystric/Eutric	Abruptic Acric Alcalic Alic Aluminic Andic Anthraquic Arenic Clayic Colluvic Drainic Endosalic Fluvic Gelic Greyic Humic Lixic Luvic Novic Petrogleyic Siltic Sodc Spodic Takyric Technic Tephric Toxic Turbic Vitric

ANDOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Vitric Aluandic/Silandic Melanic/Fulvic Leptic Gleyic Folic/Histic Mollic/Umbric Petroduric/Duric Calcic Dystric/Eutric	Acroxic Anthric Arenic Calcaric Clayic Colluvic Drainic Eutrosillic Fragic Gelic Greyic Gypsic Hydric Novic Oxyaquic Placic Siltic Skeletic Sodc Technic Thixotropic Transportic Turbic

PODZOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Carbic/Rustic Albic/Entic Gleyic Stagnic Folic/Histic/Umbric Hyperskeletal/Leptic Vitric/Silandic/Aluandic Haplic	Anthric Densic Drainic Fragic Gelic Hortic Lamellic Novic Ornithic Ortsteinic Oxyaquic Placic Plaggic Ruptic Skeletic Technic Terric Transportic Turbic

PLINTHOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Petric/Fractipetric Pisoplinthic Albic Stagnic Folic/Histic Umbric Dystric/Eutric	Abruptic Acric Alomic Arenic Clayic Colluvic Drainic Endoduric Ferric Geric Gibbsic Humic Lixic Manganiferic Novic Oxyaquic Pachic Posic Ruptic Siltic Technic Transportic Umbriglossic Vetic

NITISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Mollic/Umbric Ferralic Alic/Acric/Luvic/Lixic Humic Rhodic Dystric/Eutric	Alomic Andic Colluvic Densic Novic Oxyaquic Technic Transportic Vetic

FERRALSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Gibbsic Posic/Geric Petroplinthic/Fractiplinthic/Pisoplinthic/ Plinthic Folic Mollic/Umbric Acric/Lixic Humic Rhodic/Xanthic Haplic	Alomic Andic Arenic Clayic Colluvic Densic Dystric Eutric Ferric Manganiferic Novic Oxyaquic Ruptic Siltic Sombric Technic Transportic Vetic

PLANOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Solodic Folic/Histic Mollic/Umbric Gypsic Petrocalcic/Calcic Alic/Acric/Luvic/Lixic Vertic Dystric/Eutric	Albic Alcalic Alomic Arenic Calcaric Chromic Clayic Drainic Endogleyic Endosalic Ferric Gelic Geric Greyic Manganiferic Plinthic Ruptic Siltic Sodic Technic Thionic Transportic

STAGNOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Follic/Histic Mollic/Umbric Vertic Alic/Acric/Luvic/Lixic Albic Gleyic Gypsic Petrocalcic/Calcic Dystric/Eutric	Alcalic Aluminic Arenic Calcic Chromic Clayic Drainic Endosalic Ferric Gelic Geric Greyic Manganiferic Ornithic Placic Plinthic Rhodic Ruptic Siltic Sodic Technic Thionic

CHERNOZEMS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Voronic Glossic Petrocalcic Vertic Gleyic Luvic Calcic Haplic	Andic Anthric Arenic Clayic Densic Duric Endofluvic Endosalic Greyic Gypsic Leptic Novic Oxyaquic Pachic Petroduric Petrogypsic Siltic Skeletic Sodic Stagnic Technic Tephric Vermic Vitric

KASTANOZEMS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Petrogypsic/Gypsic/Petroduric/Duric/ Petrocalcic Vertic Gleyic Luvic Calcic Haplic	Andic Anthric Arenic Chromic Clayic Densic Endosalic Glossic Greyic Leptic Novic Oxyaquic Siltic Skeletic Sodc Stagnic Technic Tephric Vermic Vitric

PHAEZEMS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Greyic Rendzic Leptic/Skeletic Petrocalcic Vertic Gleyic Luvic Calcaric Haplic	Abruptic Albic Andic Anthric Arenic Chromic Clayic Densic Duric Endosalic Ferralic Glossic Novic Oxyaquic Pachic Petroduric Petrogypsic Siltic Sodc Stagnic Technic Tephric Vermic Vitric

GYPSISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Petric Hyperskeletal/Leptic Petrocalcic/Calcic Luvic Haplic	Arenic Aridic Arzic Clayic Duric Endogleyic Endosalic Hypergypsic Hyperochric Hypogypsic Novic Petroduric Ruptic Siltic Skeletic Sodc Takyric Technic Transportic Vertic Yermic

DURISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Petric/Fractipetric Petrocalcic/Calcic Luvic/Lixic Haplic	Arenic Aridic Chromic Clayic Endogleyic Gypsic Hyperochric Leptic Novic Ruptic Siltic Sodc Takyric Technic Transportic Vertic Yermic

CALCISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Petric Hyperskeletal/Leptic Luvic/Lixic Haplic	Arenic Aridic Chromic Clayic Densic Endogleyic Endosalic Gypsic Hypercalcic Hyperochric Hypocalcic Novic Ruptic Siltic Skeletic Sodc Takyric Technic Transportic Vertic Yermic

ALBELUVISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Gleyic Stagnic Folic/Histic Umbric Manganiferric/Ferric Alomic Dystric/Eutric	Abruptic Anthric Arenic Cambic Clayic Cutanic Densic Drainic Fragic Gelic Greyic Novic Oxyaquic Ruptic Siltic Technic Transportic

ALISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Leptic/Skeletal Fractiplinthic/Petroplinthic/ Pisoplinthic/Plinthic Gleyic Stagnic Umbric Albic Manganiferic/Ferric Humic Rhodic/Chromic Haplic	Abruptic Alomic Andic Anthric Arenic Clayic Cutanic Densic Epieutric Fragic Gelic Greyic Hyperalic Hyperdystric Hyperochric Lamellic Nitic Novic Nudiargic Oxyaquic Profondic Ruptic Siltic Technic Transportic Turbic Vertic Vitric

ACRISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Leptic	Abruptic
Fractiplinthic/Petroplinthic/Pisoplinthic/ Plinthic	Alumic
Gleyic	Andic
Stagnic	Anthric
Umbric	Arenic
Albic	Clayic
Manganiferic/Ferric	Cutanic
Humic	Densic
Rhodic/Chromic	Epieutric
Haplic	Fragic
	Greyic
	Hyperdystric
	Hyperochric
	Lamellic
	Nitic
	Novic
	Nudiargic
	Oxyaquic
	Profondic
	Ruptic
	Siltic
	Skeletal
	Sombric
	Technic
	Transportic
	Vetic
	Vitric

LUVISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Leptic/Skeletal Gleyic Stagnic Albic Vertic Calcic Manganiferrous/Ferric Rhodic/Chromic Haplic	Abruptic Andic Anthric Arenic Clayic Cutanic Densic Epidystric Escalic Fragic Gelic Greyic Humic Hypereutric Hyperochric Lamellic Nitic Novic Nudiargic Oxyaquic Profondic Ruptic Siltic Sodc Technic Transportic Turbic Vitric

LIXISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Leptic	Abruptic
Fractiplinthic/Petroplinthic/ Pisoplinthic/ Plinthic	Andic
Gleyic	Anthric
Stagnic	Arenic
Albic	Clayic
Calcic	Cutanic
Manganiferric/Ferric	Densic
Rhodic/Chromic	Epidystric
Haplic	Ferric
	Fragic
	Greyic
	Humic
	Hypereutric
	Hyperochric
	Lamellic
	Nitic
	Novic
	Nudiargic
	Oxyaquic
	Profondic
	Ruptic
	Siltic
	Skeletal
	Technic
	Transportic
	Vetic
	Vitric

UMBRI SOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Leptic/Skeletal Gleyic Stagnic Follic/Histic Mollic Albic Greyic Haplic	Alomic Andic Anthric Arenic Brunic Cambic Chromic Clayic Densic Drainic Endoeutric Ferralic Fluvic Gelic Glossic Humic Hyperdystric Loxic Novic Ornithic Oxyaquic Pachic Placic Siltic Technic Thionic Turbic Vitric

ARENOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Fractiplinthic/Petroplinthic/ Pisoplinthic/Plinthic Gleyic Salic Follic Albic Ferralic Hypoluvic/Lamellic Rubic/Brunic Protic Gypsic/Calcaric Dystric/Eutric	Aridic Gelic Greyic Hydrophobic Hyperalbic Hyperochric Novic Ornithic Petrogleyic Placic Stagnic Technic Tephric Transportic Turbic Yermic

CAMBISOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Leptic/Skeletal	Alcalic
Fractiplinthic/Petroplinthic/	Alumic
Pisoplinthic/Plinthic	Anthraquic
Vertic	Aridic
Thionic	Clayic
Gleyic	Colluvic
Gelistagnic/Stagnic	Densic
Salic	Escallic
Vitric/Andic	Ferric
Ferralic	Folic
Fluvic	Fragic
Gypsiric/Calcaric	Gelic
Rhodic/Chromic	Greyic
Dystric/Eutric	Hortic
	Humic
	Hyperochric
	Irragric
	Laxic
	Manganiferic
	Novic
	Ornithic
	Oxyaquic
	Pisocalcic
	Plaggic
	Ruptic
	Siltic
	Sodic
	Takyric
	Technic
	Tephric
	Terric
	Transportic
	Turbic
	Yermic

REGOSOLS

<i>Main map unit qualifiers</i>	<i>Optional map unit qualifiers</i>
Leptic/Skeletal	Arenic
Gleyic	Aric
Gelistagnic/Stagnic	Aridic
Thaptovitric/Thaptandic	Brunic
Tephric	Clayic
Colluvic	Densic
Gypsic/Calcaric	Escalic
Dystric/Eutric	Folic
	Gelic
	Humic
	Hyperochric
	Hyposalic
	Ornithic
	Oxyaquic
	Siltic
	Sodic
	Takyric
	Technic
	Transportic
	Turbic
	Vermic
	Yermic

EXAMPLES

Example 1

A map unit in the Mediterranean region dominated by a red soil with clay illuviation, accumulation of secondary carbonates and vertic properties, all within 100 cm, will be denominated

- at map scales of 1 : 5 000 000 or smaller
either *Luvisol* or *Vertic Luvisol*
- at map scales from 1 : 1 000 000 to 1 : 5 000 000
Calcic Vertic Luvisol
- at map scales from 1 : 250 000 to 1 : 1 000 000
Chromic Calcic Vertic Luvisol

In case the purity of the map unit permits, additional qualifiers may be added at all scales, e.g. if the soil occurs in a vast terraced area, the optional qualifier *Escallic* may be added in brackets after the name of the RSG:

Luvisol (Escallic) or *Vertic Luvisol (Escallic)*
Calcic Vertic Luvisol (Escallic)
Chromic Calcic Vertic Luvisol (Escallic)

Example 2

A map unit dominated by a soil with a black surface horizon, 30 cm thick, with high base saturation, secondary carbonates directly below the surface horizon, clay illuviation features and groundwater influence starting within 50 to 75 cm (i.e. having between 50 and 100 cm from the mineral soil surface a layer, 25 cm or more thick, that has reducing conditions in some parts and a gleyic colour pattern throughout), will be denominated

- at map scales of 1 : 5 000 000 or smaller
either *Chernozem* or *Endogleyic Chernozem*
- at map scales from 1 : 1 000 000 to 1 : 5 000 000
Luvic Endogleyic Chernozem
- at map scales from 1 : 250 000 to 1 : 1 000 000
Calcic Luvic Endogleyic Chernozem

Example 3

In a map unit, 80% of the surface is covered by a severely eroded calcareous soil with 50% gravel over hard rock starting at 80 cm, in the other 20% the soil above the hard rock has 90% gravel. This unit will be denominated

- at map scales of 1 : 5 000 000 or smaller
dominant: Regosol; associated: Leptosol or *dominant: Skeletic Regosol; associated: Hyperskeletic Leptosol* (the option *Leptic Regosol* was not chosen, because the hard rock starts only at 80 cm)
- at map scales from 1 : 1 000 000 to 1 : 5 000 000
dominant: Calcaric Skeletic Regosol; associated: Hyperskeletic Leptosol
- at map scales from 1 : 250 000 to 1 : 1 000 000
dominant: Calcaric Skeletic Regosol; associated: Hyperskeletic Leptosol (redundant qualifiers are not used; in this example the next applying qualifier for the Regosols is *Eutric*, however *Calcaric* already indicates the

high base saturation; therefore at this map scale only two qualifiers are applicable)

As in this example for the Regosols a choice had to be made between *Leptic* and *Skeletal*, which are not mutually exclusive, the non-chosen qualifier may be added in brackets after the name of the RSG:

Skeletal Regosol (Leptic)

Calcaric Skeletal Regosol (Leptic)

Example 4

A map unit dominated by a thick layer of mainly strongly decomposed acidic organic material overlying hard rock within 100 cm on a steep slope in an environment with a large excess of precipitation will be denominated

- at map scales of 1 : 5 000 000 or smaller
Histosol or *Sapric Histosol*
- at map scales from 1 : 1 000 000 to 1 : 5 000 000
Leptic Sapric Histosol
- at map scales from 1 : 250 000 to 1 : 1 000 000
Dystric Leptic Sapric Histosol

In this example the next applying qualifier is *Ombric*, however as already three map unit qualifiers are used, the fourth one may be added in brackets after the name of the RSG:

Dystric Leptic Sapric Histosol (Ombric)