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Correlation between the Polish Soil Classification (2011) and international soil classification system World Reference Base for Soil Resources (2015)

Abstract: The recent editions of the Polish Soil Classification (PSC) have supplied the correlation table with the World Reference Base for Soil Resources (WRB), which is the international soil classification most commonly used by Polish pedologists. However, the latest WRB edition (IUSS Working Group WRB 2015) has introduced significant changes and many of the former correlations became outdated. The current paper presents the closest equivalents of the soil orders, types and subtypes of the recent edition of the PSC (2011) and WRB (IUSS Working Group WRB 2015). The proposals can be used for general correlation of soil units on maps and in databases, and may support Polish soil scientists to establish the most appropriate equivalents for soils under study, as well as make PSC more available for an international society.

Keywords: Polish Soils Classification, WRB, equivalents, reference soil groups, soil types

INTRODUCTION

Pedology appeared in the second half of the 19th century as a branch of modern science. From the very beginning it was very important to develop a system of soil classification combining the scientific and application functions. Several concepts were proposed just in the 19th century, based mainly on the geological or agronomical approaches. The first attempt to soil classification related to climate and vegetation zonality was presented by Dokuchaev in 1879 (Strzemiński 1971) and then refined by himself (Dokuchaev 1886) and his successors, mainly Sibircev and Glinka (Strzemiński 1971). This so-called “genetic” approach to soil classification has spread in the world during the first decades of the 20th century.

The next milestone in the development of soil classification was a “quantitative” approach, initiated by US Soil Survey Staff in early second half of 20th Century (Soil Survey Staff 1960, Brevik et al. 2016). Numerous studies on soil genesis and classification in the following decades led to an improvement of the quantitative system as the Soil Taxonomy (Soil Survey Staff 2014) and broad international acceptance for its rational

quantitative concept. Presently, the Soil Taxonomy is used in over 40 countries (Krasilnikov 2002) as a primary system for naming the soils. However, the modern “American” terminology and breaking the link between soil genesis and classification scheme was unacceptable for many other scientists across the world, which led to the development of independent new system of international soil classification, initially as a Legend to Soil Map of the World and then – the World Reference Base for Soil Resources, WRB (FAO-ISSS-ISRIC, 1998). Although the WRB was originally designed as an umbrella encompassing all the world’s soils at rather higher classification level and small cartographic scale (“reference base”), in several countries it has been adopted as a basic soil classification and mapping system, e.g. in Mexico, Norway, Tanzania, and Vietnam (Krasilnikov et al. 2009). Nevertheless, pedologists in many countries still develop the national schemes of soil classifications and use the WRB mainly as a “lingua franca”, a tool for correlation of the national soil classification systems.

Numerous studies have been published since the release of the 1st edition of WRB (IUSS Working Group WRB 1998) aiming on the correlation issues.

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An approximated correlation between the Czech, Romanian, Latvian, and Brazilian classifications and WRB were presented by Nemeček et al. (2001), Munteanu and Florea (2002), Karklins (2002), and Palmieri et al. (2003), respectively. Correlation between the Polish soil classification, PSC (1989) and WRB was discussed in the book of Charzyński (2006). Extended comparison of the WRB and a number of national soil classifications was given by Krasilnikov (2002). A Handbook of Soil Terminology, Correlation and Classification by Krasilnikov et al. (2009) provided a correlation with the second edition of WRB. New correlations with the third edition of WRB (IUSS Working Group WRB 2006) was performed e.g. for Romanian (Secu et al. 2008) and Croatian systems (Husnjak et al. 2010). Defective correlation may result from various reasons. Soil taxa may have broader or narrower definitions in national classification than WRB groups and some taxa only partially coincide (Zádorová and Penížek 2011). The correlativity of particular soil unit depends on the level of conformity of the threshold values in its diagnostic criteria. Such limits can vary remarkably in different reference units (Shi et al. 2010). Another difficulty in correlation procedures is associated with the different analytical protocols used for delimitation of diagnostic horizons and features (Reintam and Köster 2006). Some confusion in the correlation may be born from perfunctory consideration of units named similarly or identical, or from the qualitative approach to recognition of diagnostic horizons and features. In the latter case, the “expert knowledge” prevails, and the correlations are indicated without consideration of the differences and similarities between the diagnostics criteria. Sometimes, even the authors themselves admit that their correlation is approximate only (Husnjak et al. 2010). As a result, such correlations provide only the basic interrelationships and are subject to a number of inaccuracies (Charzyński 2006).

An increasing demand for harmonized digital soil information can be observed nowadays. The correlation of national systems with WRB has got a new priority, as it is necessary for the development of European and global databases, giving the opportunity to enrich them with more new data. Interesting approach to it, based on calculations of the taxonomic distances between the selected types of Hungarian soils and related WRB RSGs was presented by Láng et al. (2013).

The recent 5th edition of Polish Soil Classification, PSC5 (2011) contains a table of correlation with WRB and the Soil Taxonomy. The third edition of WRB was released in 2014, with upgrades in 2015 (IUSS Working Group WRB 2015) with a number of

significant changes. Many of the existing correlation data require reinterpretation and updating. In fact, most of soil units cannot be simply correlated due to several reasons stated above. In case of PSC5 (2011) the main reasons of uncertainty are: traditional (“genetic”) attempt to soil classification, the lack of dichotomic (decision-making) classification key, and differences in diagnostic horizons/materials definitions.

The aim of this study is to indicate the closest correlations between the recent edition of the PSC (2011) and WRB (IUSS Working Group WRB 2015). Given proposal may support Polish soil scientists to establish the most appropriate equivalents for soils under study, as well as make PSC more clear and available for an international society. The proposal is based on a comparison of the definitions of diagnostics and properties required for soil units distinguished in both classification systems (Orders, Types and Subtypes in a case of PSC5 and Reference Soil Groups and qualifiers in the case of WRB).

THE ADAPTATION OF WRB BY POLISH SOIL SCIENTISTS

The WRB is widely used by Polish authors that was confirmed by conducted queries. More than 100 articles released in years 2011–2015, containing information about the systematic placement of soils, were analyzed in the review (Fig. 1). Four scientific journals were taken into consideration: Soil Science Annual (SSA), Polish Journal of Soil Science (PJSS), Geoderma, and Catena. The first two are the most relevant Polish journals dealing with issues of soil science. In the next two international journals the papers written by Polish authors appear more frequent recently.

In all four journals, soils were classified according to WRB in most of the papers. In the Polish journals (i.e. SSA and PJSS), WRB is commonly used simultaneously with PSC (e.g. Dębska et al. 2012, Gajewski et al. 2015, Głina et al. 2014, Mendyk et al. 2015, Muszyńska and Kabała 2015, Świtoniak 2015, Zagórski et al. 2015). WRB is the only used soil classification system in most articles published in Geoderma and Catena (e.g. Waroszewski et al. 2013, Szymański et al. 2014, Uzarowicz and Skiba 2011), whereas PSC was rarely used as the only classification (without at least comparison with international systems). Such papers were published mainly in the Polish journals as reviews or discussions on PSC (e.g. Kabała 2014, Marcinek et al. 2014), and only in one paper of Catena (Zgłobicki et al. 2015). In the latter case, names of soils have the wording similar to the WRB. Among another systems, only the Soil Taxonomy and only in

FIGURE 1. The use of classification systems in the papers focusing on Polish soils (based on papers published in years 2011–2015)

two papers was applied. In one case along with PSC (Józefaciuk and Czachor 2014), and in the second case – along with WRB (Pawlik et al. 2013).

A great importance of WRB was also reflected in pedological monographs recently published in Poland. Although related to soils of Poland, they are often published in English (Charzyński et al. (Eds.) 2013, Świtoniak and Charzyński (Eds.) 2014) or bilingually (Kabała (Ed.) 2015) with the soil names defined according to WRB.

PROPOSED CORRELATIONS OF PARTICULAR SOIL UNITS

Resent edition of WRB (IUSS Working Group WRB 2015) has introduced a number of significant changes in relation to the previous versions. The proposed correlation table (Table) includes many novel suggestions for soil classification compared with the previous proposals (PSC 2011). The English equivalents for the Polish names of orders, types and subtypes are given after the recent proposal of Świtoniak et al. (2016).

Order 1: Raw mineral soils (gleby inicjalne)

The raw soils order brings together soils at the early (initial) stage of development. WRB has allocated such soils among different RSGs characterized by little or no profile differentiation or with severe limitations to root growth. Raw rocky (gleby inicjalne skaliste) and raw debris soils (gleby inicjalne rumoszone) can

be classified as Leptosols (Table). First type comprises soils with often discontinuous thin organic layer resting directly on the hard or cracked rock, which can be emphasized by the Nudilithic qualifier (Kabała et al. 2013). For subtype of raw rocky rendzinas (rędziny inicjalne skaliste), formed by weathering of carbonate rocks, Calcaric is another vital qualifier. The second type, debris soils (gleby inicjalne rumoszone), may be apparently deep, but are extremely skeletal, thus Nudilithic qualifier have been replaced with Hyperskeletal one. Raw regosols (gleby inicjalne erozyjne) were formed by strong erosion and truncation of the original soils and the lack of soil horizons (Protic qualifier). Their current properties are strictly related to the features (e.g. texture, reaction) of unconsolidated parent materials. The forth type, raw accumulation soils (gleby inicjalne akumulacyjne) are formed mainly from recent eolian (Protic Arenosols) (Janowski et al. 2014) or fluvial (Gleyic Fluvisols) deposits. However, initially developed alluvial soils with strong *gleyic properties* starting near the mineral surface should be classified as Fluvic Gleysols. That RSG was purposely placed in the classification key before Fluvisols to emphasize greater ecological and pedological role of *reducing conditions* than geomorphological processes.

Order 2: Weakly developed soils (gleby słabo ukształtowane)

The soils of this order are at still the early stage of development, but are better developed (and thicker) than the raw soils. The occurrence of A or O horizon

which thickness often exceeds 10 cm is the most characteristic feature of these soils. According to PSC5, these A horizons are *ochric* epipedons, which cannot fulfill the criteria of other epipedons (e.g. mollic or umbric). *Ochric* horizon is no longer a diagnostic horizon in WRB, so the presence of weakly developed A horizons can be indicated by *Ochric* qualifier only. Two first soil types of this order (Table) are derived from hard rock, i.e. rankers (rankery) – from siliceous rocks (e.g. granite), and proper rendzinas (rędziny właściwe) – from carbonate rocks (e.g. limestone or dolomite). Continuous rock appears at the depth of tens of centimeters, but not deeper than 50 cm, thus the soil may belong to Leptosols or other RSGs. Commonly present thick organic (litter) horizon (thickness >10 cm) may be expressed by *Folic* qualifier. Third soil type, pararendzinas (pararędziny), have unconsolidated parent materials rich in secondary carbonates. According WRB they can be put into Calcisols; however, their origin in Poland is mainly connected with erosion and truncation of the former soil surface. Other units (Arenosols, Fluvisols, and Regosols) are analogues with earlier discussed raw soils.

Order 3: Brown earths (gleby brunatnoziemne)

Soils of this order have cambic horizon distinguished using similar criteria in WRB and SGP5, with no other significant diagnostic horizons (only *vertic* and *folic* are allowed). Therefore, brown soils can be correlated with Cambisols in general. The only important difference is the texture requirement for *cambic* in PSC5, which allows loamy sand class and finer, while WRB requires sandy loam and finer only. Thus, the brown soils with sandy loam texture in Bw horizon have to be shifted to Brunic Arenosols (IUSS Working Group WRB 2015).

The order brown earths (gleby brunatnoziemne) comprises soils developed from various parent materials: alluvial deposits, glacial tills, or strongly weathered calcareous/siliceous bedrocks, which are classified in four separate soil types by PSC5 (Table). According to WRB they belong to one RSG, and the distinction is made by the following qualifiers: Dystric, Eutric, Fluvic, Dolomitic/Calcaric, respectively (Table). Some differences in assigning of Dystric or Eutric status have to be indicated: (i) the base saturation threshold is 60% in PSC while 50% in WRB, and (ii) the control section in PSC is a depth 25–75 cm below soil surface, while in WRB, the rules of Dytric/Eutric naming are more flexible when using the prefixes (e.g. Amphidystic, Anoeutric etc.)

Order 4: Rusty soils (gleby rdzawoziemne)

The profile of rusty soils has the sandy texture throughout, thus all these soils belong to Arenosols according to WRB (IUSS Working Group 2015). Endopedons *sideric* and *rubic* defined in PSC5 are not recognized in WRB as diagnostic horizons. Their presence is expressed by the use of Brunic or Rubic/Chromic qualifiers, respectively. The only exceptions from the above mentioned classification are some ochrous soils (gleby ochrowe) with loamy *rubic* horizons. The loamy texture shifts this soil variant to Chromic/Rubic Cambisols.

Order 4: Clay-illuvial soils (gleby płowoziemne)

Clay-illuvial soils, often called soils lessives, most often have been correlated with Luvisols by Polish authors (e.g. Makuch 2012, Piotrowska and Długosz 2012, Kwiatkowska-Malina and Maciejewska 2013, Paluszek 2013) or, after the second edition of WRB, with Albeluvisols (Glina et al. 2013, Szymański et al. 2014). However, the third edition of WRB has re-evaluated the importance of *albeluvic tonguing*, which has spread the clay-illuvial soils to many different RSGs. The most important consequence for classification and cartography of soils with *argic* horizon in Poland is that the soil types of PSC5 cannot be simply correlated with RSGs of WRB.

Currently, only the non-gleyed proper clay-illuvial soils (gleby płowe typowe) can be simply correlated with Luvisols (Table). Both the proper clay-illuvial soils (gleby płowe typowe) and glossic clay-illuvial soils (gleby płowe zaciekowe) with an *abrupt textural difference* and periodic water stagnation over/in *argic* horizon are now correlated with Planosols (Kabała (Ed.) 2015, Muszytyfaga and Kabała 2015). Furthermore, both the proper and glossic clay-illuvial soils with strong stagic properties in the upper section of soil profile, but without *abrupt textural difference* may presently be correlated with Stagnosols (Kabała and Muszytyfaga 2015). Only very few glossic clay-illuvial soils belongs to Retisols (Świtoniak et al. 2014). This RSG has replaced former Albeluvisols, but strong stagic properties and *abrupt textural difference* are in these soils excluded that makes this RSG rather a marginal one. Finally, some clay-illuvial soils characterized by very low base saturation have to be described as Alisols (Świtoniak 2008, Kabała and Muszytyfaga 2015). Separate type of wet clay-illuvial soils (gleby płowe podmokłe) are characterized by strong reductic conditions and *gleyic* properties

starting near the surface, thus are a close counterpart of Luvic Gleysols.

Order 6: Podzol soils (gleby bielicoziemne)

All soils with *spodic* horizons, developed in course of podzolization, have been grouped in one order, closely related to Podzols of WRB (Table). Podzolic soils (gleby bielicowe) have humic horizon, while Podzols (bielice) are lacking A horizon (PSC 2011), which based on WRB may be distinguished by adding the Ochric qualifier to the first group.

Order 7: Black soils (gleby czarnoziemne)

Black soils are one of the most diverse and heterogeneous orders in the PSC5.

The definition of chernozems (czarnoziemy) in PSC5 is broader than its counterpart used in WRB as it partly includes the so-called “degraded chernozems”. So, the soils which do not meet restrict criteria of organic matter content, colour, and structure as defined

for *chernic* horizon (IUSS Working Group 2015), must be shifted to the Kastanozems (Fig. 2), even though it is not in line with original zonal concept of Kastanozems.

Black earths (czarne ziemie) are soils with *mollic* horizons and *gleyic* properties (Łabaz and Kabala 2014). Some of them have *calcic* horizons just below the *mollic*, thus can be described as Gleyic Chernozems. Pedons without *secondary carbonates*, usually meet the requirements for Gleyic Phaeozems, whereas the soils strongly moist and gleyed at a very shallow depth may be correlated with Mollic Gleysols.

All next three types of soils with *mollic* horizons correspond to Phaeozems (Table). Depending on the origin and character of parent material these soil types are diversified at the second classification level. Chernozemic rendzinas (rędziny czarnoziemne) developed from carbonate rocks correlate well with Rendzic Phaeozems; humic alluvial soils (mady próchniczne) most often correlate with Fluvic Phaeozems, and humic colluvial soils (gleby deluwialne czarnoziemne) derived from slope deposits may be classified as Phaeozems with Colluvic supplementary qualifier (and various main qualifiers, e.g. Haplic, Luvic, Stagnic, Gleyic etc.). Cumulative

FIGURE 2. Correlation between the type Czarnoziemy in PSC5 and related RSGs in WRB:
1 – *chernic* horizon, 2 – *mollic* horizon, 3 – *calcic* horizon or *protocalcic* properties

subtypes with humic horizon thicker than 60 cm allows to use the qualifier Pachic.

Postmurshic soils (gleby murszaste) have a dark, thick, acid, and sand-textured humus horizons characterized by lacking or weak organo-mineral complexes. These horizons have special definitions in PSC5, in relation to Polish tradition that distinguish several steps of peat material degradation and transformation of organic soil into mineral one after drainage and under intense land use (Łabaz and Kabała 2016). WRB does not specify separate diagnostic horizons of this type, but the above mentioned layers fulfill criteria of *umbric* horizon. The common feature of postmurshic soils is high ground-water level. Therefore, they correlate with two RSG depending on the intensity of *gleyic* properties in the upper part of soil profile – Umbric Gleysols or Gleyic Umbrisols. The soils are or were intensively cultivated, thus the *umbric* horizons exhibit also features of *anthric* properties which entitles to use Anthroumbric qualifier. A proposal of new specific qualifier for post-murshic horizons was also submitted to WRB (Łabaz and Kabała 2016).

Order 8: Gleysols (gleby glejoziemne)

Soils saturated with groundwater for periods long enough to develop reduction conditions and *gleyic* properties at shallow depth represent Gleysols. However, the definition of gleysols in PSC5 is narrower than in WRB and does not include soils with diagnostic horizons such as *mollic*, *umbric*, *argic*, and *spodic*. However, *histic* horizon is allowed, giving the base for separation of two subtypes (Table).

Order 9: Vertisols (vertisole)

Soils developed from clayey materials, which have ability to seasonal shrinking and swelling, are described as Vertisols in both classification systems. WRB does not provide (in the list dedicated to this RSG) suitable qualifiers for first type in this order – acid vertisols (vertisole dystroficzne), but allows addition of Epidystric as supplementary qualifier, if applicable (Table). Second type, proper vertisols (vertisole eutroficzne), has carbonates starting ≤100 cm from the soil surface. Depending on the amount of secondary carbonates, the qualifiers Calcic or Protocalcic can be used. The most distinctive feature of last type – humic vertisols (vertisole próchniczne), is dark and thick A horizon. In WRB it has to be emphasized by Pellic, which is intended for Vertisols only. It must be stated, that PSC5 does not allow *mollic* horizon

presence in vertisols (soils with *mollic/umbric* horizon may be classified in the black soils order only).

Order 10: Organic soils (gleby organiczne)

Although the definition of organic soils in PSC5 and Histosols in WRB differ, these units are quite well correlated. Fibric, hemic and sapric peat soils (gleby torfowe fibrowe, hemowe i saprowe) are related to Fibric, Hemic, and Sapric Histosol, respectively. Limnic soils (where organic material was deposited as subaquatic sediment, e.g. gyttjas) correspond to Histosols with supplementary qualifier Limnic. Follic Histosols (gleby organiczne ściółkowe, folisole) are organic soils with thick *follic* horizon containing well-aerated litter directly on continuous rock (gleby organiczne ściółkowe płytke, Follic Rockic Histosols) or in the fissures between stones/boulders (gleby organiczne ściółkowe typowe, Follic Mawic Histosols).

Order 11: Anthropogenic soils (gleby antropogeniczne)

The soils of this order were strongly transformed or created in course of intentional human activity. Two different groups of soils are assembled in this order, the soils which origins are related to agricultural activity, and soils which formation/transformation is related to construction and industrial/mining activities. The first group, called culturozems in PSC5 (gleby kulturoziemne) (Table), may be correlated with Anthrosols in WRB, as both they are distinguished based on similar criteria for diagnostic horizons such as *hortic* and *plaggic*. However, there are only some differences, as in the subtype rigosols (rigosole), that may not meet criteria of Anthrosols and, depending on the particular soil properties and morphology, may be scattered between many RSGs (Phaeozems, Arenosols, Regosols etc.). Much more problematic is the correlation of urbanozems and industrizems, which definition in PSC5 bases mainly on their localization and the fact of transformation in general, whereas the required content of *artefacts* is not clearly defined. However, it is believed, based on the existing reports (Charzyński et al. 2013 (Eds.)), that most of urbanozems and industrizems may be classified as Urbic or Spolic Technosols, respectively.

Salt-affected soils have presently a marginal position in PSC5 within the order of anthropogenic soils and require further improvement, as the salinization features occur in many “natural” soil taxa as a secondary characteristic (Hulisz 2016, Hulisz et al. 2010). According to WRB, these soils can be classified in

different RSG's, mainly Gleysols and Technosols, using the Alkalic, Salic, and Sodic qualifiers.

FINAL REMARKS

This paper shows merely the most representative counterparts of soil units in PSC5 and WRB. Consequently, the listed above correlations should be used for general description of soil cover only, whereas individual pedons may represent another Reference Soil Group of WRB that was documented by many authors (e.g. Charzyński 2006, Mendyk et al. 2015). In the detailed studies based on individual soil description and analytical data all profiles should be conventionally classified using the key to the Reference Soil Groups (IUSS Working Group 2015).

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TABLE. Correlation of soil units between Polish Soil Classification (2011) and WRB (IUSS Working Group WRB, 2015)

Order		Type		Subtype	
PSC 2011	WRB 2015	PSC 2011	WRB 2015	PSC 2011	WRB 2015
Gleby inicjalne	Leptosols, Regosols, Arenosols, Fluvisols	Gleby inicjalne skaliste	Lithic Leptosols	Gleby inicjalne skaliste bezwęglanowe (litosole)	Nudilithic/Lithic Leptosols
				Rędziny inicjalne skaliste	Calcaric Nudilithic/Lithic Leptosols
		Gleby inicjalne rumoszkowe (regosole)	Hyperskeletic Leptosols	Gleby inicjalne rumoszkowe bezwęglanowe	Hyperskeletic Leptosols
				Rędziny rumoszkowe	Calcaric/Dolomitic Hyperskeletic Leptosols
		Gleby inicjalne erozyjne	Protic Regosols	–	Dystric/Eutric Protic Regosols
		Gleby inicjalne akumulacyjne	Protic Arenosols; Gleyic Fluvisols (Protic); Fluvic Gleysols (Protic)	–	Dystric Protic Arenosols; Protic Gleyic Fluvisols (Arenic, Protic); Protic Fluvic Gleysols (Arenic, Protic)
Gleby słabo ukształtowane	Leptosols, Regosols, Arenosols, Fluvisols, Regosols, Calcisols	Rankery	Leptosols	typowe	Dystric/Eutric Skeletic Leptosols (Ochric)
				butwinowe	Dystric Folic Leptosols (Ochric)
				z cechami bielcowania	Dystric Leptosols (Albic/Protosodic)
				z cechami brunatnienia	Cambic Leptosols (Ochric)
		Rędziny właściwe	Calcaric Leptosols	typowe	Calcaric/Dolomitic Leptosols (Ochric)
				butwinowe	Calcaric/Dolomitic Folic Leptosols (Ochric)
		Pararędziny	Calcisols, Calcaric Regosols	typowe	Haplic Calcisols (Ochric); Calcaric Regosols
				z cechami brunatnienia	Haplic Calcisols (Ochric); Calcaric Regosols
		Arenosole	Arenosols	–	Dystric/Albic/Folic Arenosols (Ochric)
		Mady właściwe	Fluvisols	–	Dystric/Eutric/Gleyic Fluvisols (Ochric)
		Gleby słabo ukształtowane erozyjne	Regosols	–	Dystric/Eutric/Skeletic Regosols (Ochric)
Gleby brunatno-ziemne	Cambisols	Gleby brunatne eutroficzne	Eutric Cambisols	typowe	Endocalcaric Cambisols
				próchniczne	Endocalcaric Cambisols (Humic)
				wylugowane	Eutric Cambisols
				opadowo-glejowe	Eutric Stagnic Cambisols
				gruntowo-glejowe	Eutric Gleyic Cambisols
				z cechami vertic	Eutric Vertic Cambisols
		Gleby brunatne dystroficzne	Dystric Cambisols	typowe	Dystric Cambisols
				próchniczne	Dystric Cambisols (Humic)
				z cechami bielcowania	Dystric Cambisols (Protosodic)
				opadowo-glejowe	Dystric Stagnic Cambisols
				gruntowo-glejowe	Dystric Gleyic Cambisols
				z cechami vertic	Dystric Vertic Cambisols
		Mady brunatne	Fluvic Cambisols	typowe	Fluvic Cambisols
				oglejone	Fluvic Gleyic Cambisols
		Rędziny brunatne	Dolomitic/Calcaric Cambisols	typowe	Dolomitic/Calcaric Cambisols
				czerwonoziemne	Dolomitic/Calcaric Chromic Cambisols

Table continued

Order		Type		Subtype	
PSC 2011	WRB 2015	PSC 2011	WRB 2015	PSC 2011	WRB 2015
Gleby rdzawo-ziemne	Arenosols	Gleby rdzawe	Brunic Arenosols	typowe	Dystric Brunic Arenosols
				z cechami bielcowania	Albic Brunic Arenosols
				gruntowo-glejowe	Brunic Gleyic Arenosols
		Gleby ochrowe	Rubic/Chromic Arenosols	typowe	Rubic/Chromic Arenosols
Gleby płowo-ziemne	Luvisols, Planosols, Retisols, Stagnosols, Alisols	Gleby płowe	Mostly: Luvisols, Planosols (see: subtypes)	typowe	Haplic/Albic Luvisols; Albic Alisols
				spiaszczone	Abruptic Luvisols (Epiarenic, Endoloamic) – if there is no stagnic features (seldom); Luvic Planosols (Epiarenic, Endoloamic) – with stagnic features (usually)
				spiaszczone oglejone	Luvic Gleyic Planosols (Epiarenic, Endoloamic)
				opadowo-glejowe	Stagnic Luvisols; Luvic Stagnosols
				gruntowo-glejowe	Gleyic Luvisols
				z poziomem agric	Albic Luvisols (Densic)
				próchniczne	Albic Luvisols (Aric, Humic)
				piaszczyste	Lamellic Luvisols (Arenic)
				z cechami brunatnienia	Albic Luvisols (Neocambic)
				z cechami bielcowania	Albic Alisols (Protospodic)
				z cechami glossic	Albic/Fragic Retisols
				z cechami vertic	Vertic Luvisols (Endoclayic)
		Gleby płowe zaciekowe	Mostly: Retisols, Planosols (see: subtypes)	typowe	Albic/Glossic Retisols
				spiaszczone	Albic Retisols (Abruptic, Epiarenic, Endoloamic) – if no Stagnic features (seldom); Luvic Glossic Planosols (Epiarenic, Endoloamic) – with stagnic features (usually)
				opadowo-glejowe	Stagnic Retisols – in case of weak stagnic properties; Luvic Glossic Stagnosols – in case of strong stagnic properties
				gruntowo-glejowe	Gleyic Retisols
				z poziomem agric	Albic Retisols (Densic)
				próchniczne	Albic Retisols (Aric, Humic)
				z cechami brunatnienia	Albic Retisols (Neocambic)
				z cechami bielcowania	Albic Glossic Alisols (Protospodic)
				z cechami vertic	Vertic Retisols (Endogleyic)
		Gleby płowe podmokłe	Gleysols (Luvic)	typowe	Dystric/Eutric Gleysols (Luvic)
				próchniczne	Dystric/Eutric Gleysols (Humic, Luvic)
Gleby bielico-ziemne	Podzols	Gleby bielcowe	Podzols	typowe	Albic/Entic Podzols (Ochric)
				orsztynowe	Ortsteinic Podzols (Ochric)
				glejobielcowe typowe	Gleyic Albic Podzols (Ochric)
				glejobielcowe orsztynowe	Gleyic Ortsteinic Podzols (Ochric)
				glejobielcowe murszaste	Gleyic Podzols (Humic)
				glejobielcowe torfiaste	Gleyic Podzols (Humic)

Table continued

Order		Type		Subtype	
PSC 2011	WRB 2015	PSC 2011	WRB 2015	PSC 2011	WRB 2015
Gleby bielico-ziemne	Podzols	Bielice	Podzols	typowe	Albic (Folic) Podzols
				orsztynowe	Albic Ortsteinic Podzols
				stagnobielice	Stagnic (Folic/Histic) Albic Podzols
				glejobielice typowe	Gleyic (Folic/Histic) Albic Podzols
				glejobielice orsztynowe	Gleyic Ortsteinic Albic Podzols
Gleby czarno-ziemne	Chernozems, Phaeozems, Kastanozems, Umbrisols Gleysols	Czarnoziemny	Chernozems, Kastanozems	typowe	Haplic/Calcic Chernozems; Haplic/Calcic Kastanozems; Haplic Phaeozems (Bathycalcic)
				kumulacyjne	Haplic/Calcic Chernozems (Pachic)
				z poziomem cambic	Haplic/Calcic Chernozems (Cambic); Cambic Phaeozems (Bathycalcic)
				z poziomem argic	Luvic Chernozems
				opadowo-glejowe	Haplic/Calcic Chernozems (Stagnic)
		Czarne ziemie	Gleyic Phaeozems, Gleyic Chernozems	typowe	Gleyic/Stagnic Phaeozems; Gleyic/Stagnic Chernozems
				kumulacyjne	Gleyic/Stagnic Phaeozems (Pachic); Gleyic/Stagnic Chernozems (Pachic)
				z poziomem cambic	Cambic Gleyic Phaeozems
				z poziomem argic	Luvic Gleyic/Stagnic Phaeozems
				z poziomem calcic	Gleyic/Stagnic Calcic Chernozems
				wylugowane	Gleyic/Stagnic Phaeozems; Gleyic/Stagnic Umbrisols
				glejowe	(Calcic) Mollic Gleysols
				murszaste	Gleyic Umbrisols (Arenic, Hyperhumic); Gleyic Phaeozems (Hyperhumic)
		Rędziny czarnoziemne	Rendzic Phaeozems	typowe	Rendzic Phaeozems
				z cechami brunatnienia	Cambic Rendzic Phaeozems
				opadowo-glejowe	Stagnic Rendzic Phaeozems
		Mady czarnoziemne	Fluvic Phaeozems	typowe	Fluvic Gleyic Phaeozems
				z cechami brunatnienia	Cambic Fluvic Phaeozems
	Gleby deluwialne czarnoziemne		Phaeozems (Colluvic)	typowe	Haplic Phaeozems (Colluvic)
				kumulacyjne	Haplic Phaeozems (Colluvic, Pachic)
	Gleby murszaste		Umbric Gleysols; Gleyic Umbrisols	typowe	(Anthro)umbric Gleysols (Arenic); intensively drained: Gleyic Umbrisols (Arenic)
				żelazisto-murszaste	(Anthro)umbric Gleysols (Arenic, Ferric); intensively drained: Gleyic Umbrisols (Arenic, Ferric)
				murszowate	(Anthro)umbric Gleysols (Humic/Hyperhumic)
Gleby glejoziemne	Gleysols	Gleby glejowe	Gleysols	typowe	Dystric/Eutric Gleysols
				torfiasto-glejowe	Dystric/Eutric Gleysols (Humic)
				torfowo-glejowe	Histic Gleysols
				mułowo-glejowe	Fluvic Histic Gleysols
				murszowo-glejowe	Histic Gleysols (Murshic)

Table continued

Order		Type	Subtype		
PSC 2011	WRB 2015	PSC 2011	WRB 2015	PSC 2011	WRB 2015
Vertisole	Vertisols	Vertisole dystroficzne	Haplic Vertisols (Epidystric)	–	–
		Vertisole eutroficzne	Haplic Vertisols (Protocalcic) Calcic Vertisols	–	–
		Vertisole próchniczne	Pellic Vertisols (Stagnic)	–	–
Gleby organiczne	Histosols	Gleby torfowe fibrowe	Fibric Histosols	typowe	Fibric Histosols
				hemowo-fibrowe	Epifibric Endohemic Histosols
				limnowo-fibrowe	Fibric Histosols (Endolimnic)
		Gleby torfowe hemowe	Hemic Histosols	typowe	Hemic Histosols
				saprowo-hemowe	Epihemic Endosapric Histosols
				fibrowo-hemowe	Epihemic Endofibric Histosols
				limnowo-hemowe	Hemic Histosols (Endolimnic)
				hemowe zamulone	Hemic Histosols (Mineralic)
				hemowe płytkie	Hemic Histosols (Mineralic/Limnic)
		Gleby torfowe saprowe	Sapric Histosols	typowe	Sapric Histosols
				fibrowo-saprowe	Episapric Endofibric Histosols
				hemowo-saprowe	Episapric Endohemic Histosols
				limnowo-saprowe	Sapric Histosols (Endolimnic)
				saprowe zamulone	Sapric Histosols (Mineralic)
				saprowe płytkie	Sapric Histosols (Mineralic/Limnic)
		Gleby organiczne ściółkowe	Folic Histosols	typowe	Mawic Folic Histosols
				płytkie na skałach litych	Rockic Folic Histosols
		Gleby organiczne limnowe	Histosols (Limnic)	typowe	Drainic Histosols (Limnic)
				hemowo-limnowe	Hemic Histosols (Limnic)
				węglanowo-limnowe	Drainic Histosols (Calcaric, Limnic)
		Gleby organiczne murszowe	Murshic Histosols	fibrowo-murszowe	Murshic Endofibric Histosols
				hemowo-murszowe	Murshic Endohemic Histosols
				saprowo-murszowe	Murshic Endosapric Histosols
				limnowo-murszowe	Murshic Histosols (Limnic)
Gleby antropogeniczne	Anthrosols, Technosols	Gleby kulturoziemne	Anthrosols	z poziomem plaggic	Plaggic Anthrosols
				z poziomem hortic (hortisole)	Hortic Anthrosols
				z poziomem anthric	Hortic Anthrosols; Haplic Phaeozems (Anthric); Haplic/Mollic Umbrisols (Anthric)
				regulówkowe (rigosole)	many soil units with plough layer thickness >50 cm, e.g. Fluvic Phaeozems (Pachic) , Gleyic Umbrisols (Pachic) , Haplic Luvisols (Anoacic)

Table continued

Order		Type		Subtype	
PSC 2011	WRB 2015	PSC 2011	WRB 2015	PSC 2011	WRB 2015
Gleby antropogeniczne	Antrosols, Technosols	Gleby przemysłowe	Technosols, Regosols	inicjalne	Spolic Technosols, Relocatic Regosols
				próchniczne	Spolic Technosols (Humic/Ochric)
				przekształcone chemicznie	various soil units (e.g. Technosols, Regosols, Luvisols) with Toxic qualifier
	Gleby miejskie	Urbic Technosols	inicjalne	Urbic Technosols, Relocatic Regosols	
			próchniczne	Urbic Technosols (Humic/Ochric)	
			przekształcone chemicznie	various soil units (e.g. Technosols, Regosols, Luvisols) with Toxic qualifier	
			uszczelnione lub przykryte (ekranosole)	Ekranic Technosols	
			Gleby słone i zasolone	Gleysols, Technosols	–

Korelacja między Systematyką gleb Polski (2011) a Światową Bazą Referencyjną Zasobów Glebowych WRB (2015)

Streszczenie: Ostatnie wydanie Systematyki gleb Polski zawiera tabelę korelacyjną z World Reference Base for Soil Resources (WRB), która jest najczęściej wykorzystywaną klasyfikacją międzynarodową przez polskich gleboznawców. Jednakże, najnowsze wydanie WRB (IUSS Working Group WRB 2015) wprowadziło wiele istotnych zmian, co spowodowało zdezaktualizowanie się wielu wcześniejszych korelacji. Niniejsza publikacja prezentuje najbliższe odpowiedniki rzędów, typów i podtypów gleb wyróżnionych w piątym wydaniu Systematyki gleb Polski oraz grup referencyjnych WRB (IUSS Working Group WRB 2015). Przedstawione propozycje mogą znaleźć zastosowanie w ogólnej korelacji jednostek glebowych na mapach i w bazach danych, a także mogą być wykorzystywane przez polskich gleboznawców przy ustalaniu indywidualnych odpowiedników dla badanych gleb. Ponadto, zaproponowana tabela korelacyjna ułatwi odbiór Systematyki gleb Polski w międzynarodowym środowisku gleboznawczym.

Słowa kluczowe: Systematyka gleb Polski, WRB, odpowiedniki, referencyjne grupy gleb, typy gleb