Is There a Case to be Made for a "Wet" Soil Order?

DEPARTMENT OF ENVIRONMENTAL SCIENCE & TECHNOLOGY

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ABSTRACT

Early soil classification systems recognized wet soils at the highest categorical level. Bog soils and half-bog soils were among the great soil groups in the US classification utilized between the 1920s and 1960. In other systems, groups named with such terms as ground water gley and pseudogley were also used. With the advent of Soil Taxonomy and it's precursor (1960, 1975), histosols (organic soils) were distinguished as one of the initial 10 soil orders, and while many of these organic soils are wet soils, some are not (Folists for example). Thus, for over 50 years, with the exception of Histosols, wet soils (which typically represent the wettest end of subaerial wet soils) have not been collectively recognized within taxa at the highest categorical level (order). Rather, wet soils were designated at the second categorical level as wet (aqu) suborders among the various soil orders, and more recently, subaqueous soils as wass suborders. Notwithstanding, other contemporary soil classification systems do (continue to) recognize wet soils at the highest level. In the World Reference Base (WRB) for example, wet soils are designated as Gleysols or Stagnosols. As efforts are underway to revisit, simplify and revise Soil Taxonomy, questions have been raised regarding whether wet soils should again be moved back with a place among taxa at the highest category using names such as Hydrasols, Aquasols, etc. This paper will explore and consider the questions and arguments for and against such proposals.

SOME ARGUMENTS FOR ESTABLISHING A WET SOIL ORDER

- The *National Soil Survey Handbook* (Soil Survey Staff, 2015) recognizes over 30 interpretations that are driven by the depth of the water table. Therefore, establishing a wet soil order **would permit recognition of one of the most important properties governing interpretations (extreme or extended periods of soil wetness) at the highest categorical level.**
- When *Soil Taxonomy* was developed over 50 years ago, hydric soils and wetlands were considered of low economic and environmental importance, but in the intervening decades they have become recognized as providing valuable ecosystem services. Therefore, establishing a wet soil order **could help in developing a better correspondence between *Soil Taxonomy* and hydric soils,** although we understand that specific morphological indicators for hydric soils will continue to be developed regionally.
- The WRB recognizes wet soils (Gleysols and Stagnosols) at the highest level as reference soil groups. Therefore, establishing a wet soil order **would be more like the WRB and would be consistent with the guiding principles to: "complement the concepts used in other soil taxonomic systems (specifically the WRB)".** This should improve "buy in" from the international community.
- Currently, Aqu suborders are defined differently depending on the order. The complexity arising from these differences make the learning and use of *Soil Taxonomy* much more difficult. Therefore, establishing a wet soil order **would permit application of more uniform (and simplified) criteria in the recognition of wet soils across the spectrum.**

EARLY U.S. SOIL CLASSIFICATION SYSTEM

From Table 2. Classification of Soils on the Basis of their Characteristics[1]

VI	V	VI
Zonal	Soils of the cold zone	Tundra
	Light colored soils of arid regions	Desert Red Desert Sierozem Brown Reddish-Brown
	Dark colored soils of the semi-arid, subhumid, and humid grasslands	Chestnut Reddish Chestnut Chernozem Prairie Reddish Prairie
	Soils of the forest-grassland transition	Degraded Chernozem Noncalcic Brown or Shantung Brown
	Light colored podzolized soils of the timbered regions	Podzol Brown Podzolic Grey-Brown Podzolic
	Lateritic soils of forested warm temperature and tropical regions	Yellow Podzolic Red Podzolic Yellowish-Brown Lateritic Reddish-Brown Lateritic Laterite
Intrazonal	Halomorphic	Solonchak Solonetz Soloth
	Hydromorphic	**Wiesenboden** **Bog** **Half-Bog** **Planosols** **Ground-Water Podzols** **Ground-Water Laterites**
	Calomorphic	Brown Forest Rendzina
Azonal		Lithosols Alluvial soils Sands, dry

1-Baldwin, M., Kellogg, C. E. & Thorp, J. 1938. Soil Classification. In: Soil and Men, Yearbook of Agriculture. USDA, US Govt. Print. Office, pp. 979 – 1001.

GUY SMITH'S RATIONALLE IN SOIL TAXONOMY

When asked specifically why wet soils were handled the way they were in Soil Taxonomy . . .

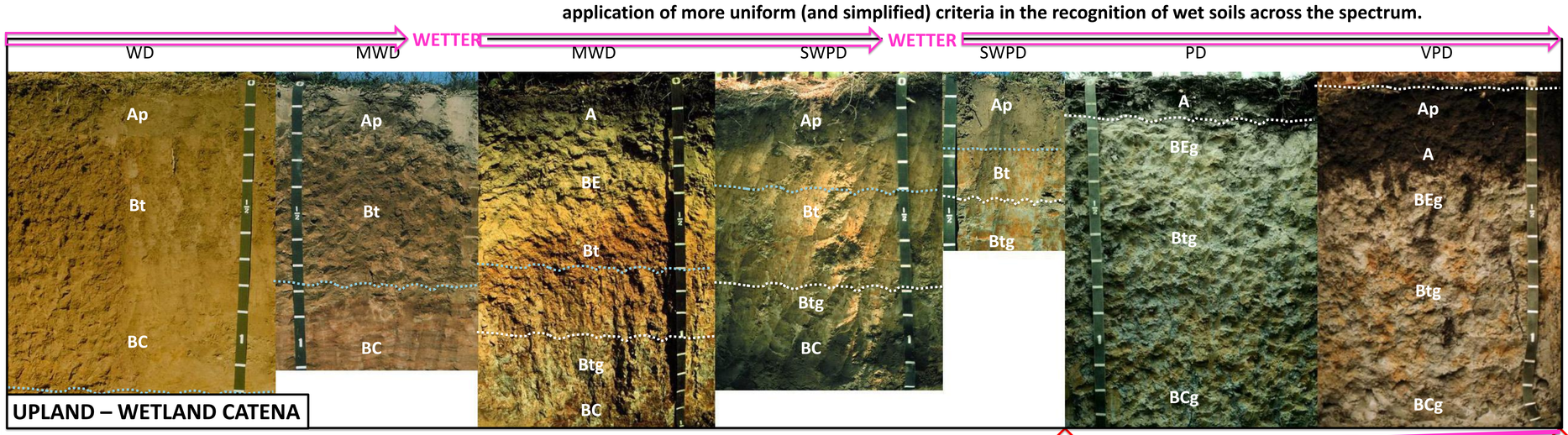
- Acknowledgment "*In Soil Taxonomy we divided up the wet soils and we put them at the suborder level, not at the order level,*" . . . . "*most other taxonomies have an all wet soils group.*" "*the Europeans . . . want one order for all the wet soils.*"
- Explanation: "*There was a zonality to the soils with aquic moisture regimes and this would be best reflected if the aquic soils with aquic moisture regimes were separated below the order level.*"
  - "*compared the yields on . . . . . the plots that were all Udolls and the plots that were all Aquolls (had been drained). . . . . they were identical.*"
  - "*if one goes into the Southeast, in the region of Ultisols, one would have the same experience, that after drainage the naturally poorly drained soils will behave like the naturally well drained soils of that area.*"

WORLD REFERENCE BASE (WRB) 2014

Overview of Key to Reference Soil Groups

Histosols	79	Solonchaks	86	Planosols	93	Gypsisols	100	Cambisols	107
Anthrosols	80	**Gleysols**	**87**	Stagnosols	94	Calcisols	101	Arenosols	108
Technosols	81	Andosols	88	Chernozems	95	Retisols	102	Fluvisols	109
Cryosols	82	Podzols	89	Kastanozems	96	Acrisols	103	Regosols	110
Leptosols	83	Plinthosols	90	Phaeozems	97	Lixisols	104		
Solonetz	84	Nitisols	91	Umbrisols	98	Alisols	105		
Vertisols	85	Ferralsols	92	Durisols	99	Luvisols	106		

Gleysols GL: Groundwater-affected soils, underwater soils and soils in tidal areas
Stagnosols ST: Stagnating water, structural difference and/or moderate textural difference



POSSIBLE PROPOSAL - A new order for wet mineral (not-organic) soils

Possible name: Hydrasols or Aquasols

Wet Soil Order Criteria: several possibilities depending on the intention and where to split along the wet continuum

1. Current Aqu suborders: Include very poorly, poorly ,and at least some somewhat poorly drained soils
   sustained aquic conditions within 40 cm of the soil surface
   Considerations:
   a. would include many soils across most orders, some of which are not especially wet (easily drained)
   b. Guy Smith's argument regarding zonality of wet soils suggests keeping these within other orders
2. Typic/not-Aeric portions of current Aqu suborders: exclude marginally wet soils (somewhat poorly drained)
   sustained aquic conditions within some shallower depth - 25 cm of the soil surface? 10 cm of the surface?
   Considerations:
   a. takes only those soils that are wettest
   b. Guy Smith's argument regarding zonality of wet soils may still argue for keeping these within other orders
3. Peraquic soils: essentially permanently wet, such as swamps, marshes, bogs, fens etc, supporting emergent vegetation
   nearly continuous aquic conditions at or near the soil surface
   Considerations:
   a. This break includes only soils that have little potential for drainage or agriculture; the wettest of wet soils
   b. This leaves many very wet soils outside of this class of wet soils
4. Subaqueous soils: permanently flooded too deep to support emergent vegetation
   use current definition for Wass suborders of Entisols
   Considerations:
   a. This break would separate only soils in subaqueous landscapes, a very narrow concept of the wettest soils.
   b. It would be the easiest to implement and would have smallest impact on present *Soil Taxonomy*
   c. A great many wet soils would not be included within this order of wet soils.