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Dr. Shaw,

The Illinois Soil Classifiers Association (ISCA) has reviewed the proposed Aquasols order and supporting documentation. ISCA members oppose the current proposal to add the Aquasols order to Soil Taxonomy in any format that applies to terrestrial soils. Our main concern is that the emphasis of hydrology over genesis will not improve but degrade the utility and cohesion of Soil Taxonomy. The proposed change will serve to reduce the information conveyed by taxonomy at the suborder through subgroup levels, will emphasize hydrology over all other soil genetic and morphological characteristics, and will be in conflict with many of the tenets of soil taxonomy.

### **Taxonomic Development and Guy Smith**

The proposal's authors begin by quoting the subtitle of Soil Taxonomy, "A Basic System for Making and Interpreting Soil Surveys", as proof that interpretive groups should define taxa, but Soil Taxonomy states the opposite.<sup>1</sup> The general term "classification includes taxonomy, but it also includes the grouping of soils according to limitations that affect specific purposes." "For example, one might want a group that includes all soils that are water logged..." but "no matter how a single hierarchy is arranged, it is not possible to have all desired groups. Therefore, no single hierarchy can best serve all our purposes." Soil Taxonomy cannot be defined by an interpretive grouping but should operate separately. The proposal states that the creation of the hydric soils criteria was unfortunate, but it is exactly what Taxonomy envisioned, an example of a grouping or classification of multiple taxa for a specific purpose.

The authors further state, "Adopting a wet soil order would therefore emphasize the importance of soil interpretations at the highest level in Soil Taxonomy." But again, there is no place in Soil Taxonomy where interpretations or interpretive groups are a driving force in defining taxa at the level. The order is defined as "differentiated by the presence or absence of diagnostic horizons or features that reflect soil-forming processes." Perhaps the authors want to use depth to water table as a soil-forming process, when it is really the product of a combination of climate and topography. By using depth to water table at the order level, they have confused the property or feature with the processes that created it and adopted the grouping as a definition. This was and is not the purpose of Soil Taxonomy.

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<sup>1</sup> Soil Survey Staff. 1999. *Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys*. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Taxonomy states that Mollisols “form under grass in climates that have a moderate to pronounced seasonal moisture deficit.” This deficit created an epipedon that was dark but was made up of mineral not organic soil material. This moisture deficit and the oxidation of plant material during significant times of the year created the diagnostic horizon that defines Mollisols, including Aquolls, before the installation of artificial drainage.

Invoking the ghost of Guy Smith, the authors ignored Dr. Smith’s response to the question, “Why not an aquic order?” He considered the hypothetical combination of drained Aquolls and drained Aquults into an aquic order. He concluded “that if we established an order of the aquic great groups, we would have some very strange bedfellows”<sup>2</sup> based on just these two orders’ differences. He went on to say, “We would be better off to keep the Aquolls with the other Mollisols and the Aquults with the other Ultisols.” This is true of the other orders that the proposal in question combines into the Aquasols. In other words, creating an aquic order as proposed would constitute a hodgepodge of dissimilar soils.

### **Data-Driven Justification**

Requests for other groundwater-driven interpretations, such as drainage class, basements, depth to water table, hydric soil rating, and hydrologic soil group, will not be simplified with the introduction of the Aquasols order. These interpretations do not currently relate well to taxonomy, nor would they be enhanced. Aquic suborders, great groups, and subgroups are currently quite divergent within and especially between orders. The only hydrologic clarification that Aquasols would bring is that aquic conditions are present within (or above) the upper 30cm (a depth tied to current regulatory schemes). More utility/parity could be gained between and among orders with a careful restructuring of existing suborder or lower classifications.

Other purported justifications include that the five top soil information requests involve depth to water table/aquic conditions. However, the first example, Hydrologic Soil Group, actually refers to the propensity of a soil to foster runoff as it relates to the potential for soil erosion. These are mainly functions of topography and infiltration, with soil wetness being only one parameter. The authors also cite farmland classification as being dependent on depth to water table, but it is rather based on the categories of Prime, Statewide Important, and Unique Farmland based on their suitability “to produce food, feed, fiber, forage, and oilseed crops.” Indeed, in tailoring Taxonomy, a scientific system, to temporal regulatory schemes and classifications, the seeds are planted for future incompatibility. Regulations often change in lockstep with political goals, with or without the input of science.

### **Taxonomy and Ecosystem Services**

The authors tout wetness as “the foundation and structure of a range of unique and valued ecosystems. Creating a wet soil order explicitly recognizes the values and functions of these soils which serve as the core of all soil interpretations.” This is a conveniently partial truth in that wetness or the occurrence of intermediate conditions, such as moderately wet through moderately dry, also fosters unique associated ecosystems. Prairie ecosystems, due to soil and climatic conditions, are unique to Mollisols over a variety of hydrologic conditions. It does not follow that creation of an Aquasols order will aid ecosystem characterization any more than the current system in terrestrial landscapes.

As one follows a hydrosequence/catena down the landscape, it is illogical that soil orders must also change when wetness is only one of the many variables that makes “a soil” and its associated ecosystem. Again, as Guy Smith predicted, we will have “strange bedfellows.” Creating differing soil

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<sup>2</sup> U.S. Soil Conservation Service, “The Guy Smith Interviews: Rationale for Concepts in Soil Taxonomy” (1986). *Natural Resources-Planning, Management, and Conservation*. Paper 1. [https://digitalcommons.usu.edu/govdocs\\_nr/1](https://digitalcommons.usu.edu/govdocs_nr/1)

orders tied to one and only one characteristic rather than multiple soil-forming factors will unnecessarily complicate or obscure relevance of the hydrosequence/catena.

## Loss of Information and Reclassification of Hydrology

We concur with Dr. Darrell Schulze's (Purdue) observations<sup>3</sup> that there will be a loss of conveyed information in the current Aquasols scheme while ambiguity will be introduced regarding a soil's hydric or nonhydric status. Taxonomy is the language soil scientists converse in. It implies much more than how wet the soils are. Immediately apparent is that the recognition of endosaturation vs episaturation, aeric and pachic subgroups, fragipans deeper than 40cm, and likely more are lost under this proposal. Dr. Schulze also observed that series not considered hydric (Blount-Aeric Epiqualfs) reclassify as Typic Densileptaq along with a significant loss of important information. A cursory survey of somewhat poorly drained Mollisols indicates that the Amana, Raub, Rowley, Nevin, Nicolet, Ottosen, Merton, Fostoria, Crippen, and Arkton series will fall within the proposed Mollihumaq subgroups.

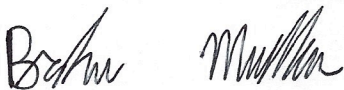
The point is that insufficient research or testing has been conducted of soils at the very least in the Mollisols and Alfisols orders. In contrast with proposals for other new soil orders, input has not been widely solicited from states or regions expected to incur significant impacts as a result of adoption. *Stated simply, needed research is incomplete.*

## Summary of Concerns

While creating the Aquasols order may be perceived by some as an advancement in the utility of taxonomy, its application to terrestrial soils among all existing orders save Gelisols and Histosols is emphatically not. ISCA feels adoption of the Aquasols order, as currently proposed, will reduce rather than improve the utility of Soil Taxonomy if applied to terrestrial soils. There is little debate from us that the Wassaq and Peraq Aquasol suborders have a place in Soil Taxonomy. However, with the adoption of the other proposed suborders, there is little information regarding impacts to terrestrial soils, possible creation of legacy suborders, existing pedon databases, soil maps, or possible effects on existing regulatory programs. Should Aquasols be generically characterized as waters of the U.S., the potential for widespread regulatory consequences to local, state, and Federal regulations is far reaching and also has apparently not been considered.

In addition to those of Dr. Schulze, we fully concur with the concerns and recommendations of the Taxonomy Committee Report from the 2023 National Cooperative Soil Survey Conference.<sup>4</sup>

Tendered for your consideration,



The Illinois Soil Classifiers Association

(by: Brandon Mueller, President)

<sup>3</sup> <https://nrsc.app.box.com/s/my3lhuuiu9wenlycuottbep5ff63pqq/file/1255200676465>

<sup>4</sup> <https://nrsc.app.box.com/s/ne2f2elugzqlrip99s5c6xeowijfp2s/file/1317110022805?sb=/details>