A Wet Soil Order in Soil Taxonomy

Mark Stolt

ICOMSAS
In 2015 the Soil Science Society of America established a task force to develop fundamental changes in Soil Taxonomy.

**Task Force Objective:** make fundamental changes to Soil Taxonomy so that the system can be more efficient and useful to the soil science community it serves, and serve as an effective and engaging tool for the soil science community to reach other disciplines and communities that use soils information.
Increase in Inceptisol subgroups between 1975 and 2010
Soil Taxonomy
A Basic System of Soil Classification for Making and Interpreting Soil Surveys

Complicated
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A Basic System of Soil Classification for Making and Interpreting Soil Surveys

Complicated

“garbage can” taxa such as Dystrudepts and Haplustalfs

Soil Taxonomy Issues Addressed by the Task Force

Redefining kandic horizons – completed and accepted

Redefining the mollic epipedon – a proposal is in review

Redefining organic soil materials -- a proposal is in review

Moving soil moisture regime to the family level in selected taxa – a paper outlining the pros and cons of making such a change is currently in review

Creating a soil order for anthropogenic soils – not a charge for the task force but a consequence of our efforts

Creating a wet soil order for mineral soils – a proposal is in the works reported on here
### SSSA Task Force Members

<table>
<thead>
<tr>
<th>Mark Stolt, Univ. of Rhode Island (chair)</th>
<th>David Lindbo, NRCS</th>
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<tr>
<td>Brian Needelman, Univ. of Maryland (co-chair)</td>
<td>Curtis Monger, NRCS</td>
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<td>Dylan Beaudette, NRCS</td>
<td>Anthony O'Geen, Univ. of California-Davis</td>
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<td>Patrick Drohan, Penn State</td>
<td>Marty Rabenhorst, Univ. of Maryland</td>
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<td>John Galbraith, Virginia Tech</td>
<td>Mickey Ransom, Kansas State</td>
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<td>Joey Shaw, Auburn</td>
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SOME ARGUMENTS FOR ESTABLISHING A WET SOIL ORDER

When asked specifically whether wet soils had been handled in Soil Taxonomy

GUY SMITH'S RATIONALE IN SOIL TAXONOMY

World Reference Base (WRB) 2014

In Soil Taxonomy we divided up the wet soils and we put them at the suborder level, not at the order level... "most other taxonomists have put wet soils in a different order"... "Soil Taxonomy is not the only order for all the wet soils."

Exploration: "If one goes into the Southeast, in the region of Ultisols, one would have to argue that the wettest soils should be in a new order... And this would be best reflected if the aquic soils with aquic moisture regimes were separated below the order level..."

The WRB 2014 recognizes wet soils (Gleysoils and Stagnosols) at the highest level as reference soils. Therefore, establishing a wet soil order would be more 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, suborders are defined differently depending on the order. The complexity arising from these differences makes 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.


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ABSTRACT

Soil Wetness Continuum

Early soil classification systems recognized wet soils at the highest categorical level. Among the numerous soils of the US classification utilized between the 1930s and 1950s, Histosols (organic soils) were distinguished as one of the initial soil orders, and while some of these organic soils were (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 recognized at the highest categorical level (order) in the US soil classification system. Rather, the wettest soils were designated at the second categorical level as wet (Aqu) suborders among the various soil orders, and more recently, subcategories such as "Wet" suborders ofHistosols and Histosols. Soils with wettest conditions have been recognized at the subaerial level. Further, in impermeable and regions of transgressing rising or falling water tables, subaerial aquatic soils have been found that clearly classify in soil orders that do not accommodate subaerial soils. Other "wet" suborders, such as Histosols and Histosols, have been used. Other contemporary soil classification systems do have continued bid recognition wet soils at the highest level. In the World Reference Base (WRB) for example, wet soils are designated as Aquic soils and Aquic soils. Analyses, simply, and more recent soil Taxonomy, questions have been raised whether wet soils should either be moved back with a place among the higher category using a more specific, suborder, Aquic soils, etc. This paper will explore and consider the questions and arguments for and against such proposals and the difficult question regarding the logical level at which the most reasonable break would be the best point for recognizing wet soil order.

Yao, 2006

The Soil Science Society of America Journal, volume 70, number 3, 2006, pages 790-798

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Cornie van Huyssteen – University of the Free State, South Africa
Rob Fitzpatrick – University of Adelaide, Australia
Mark Stolt – University of Rhode Island
### Keys to Soil Orders

<table>
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<tr>
<th>Current</th>
<th>Proposed</th>
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<tr>
<td>1. Gelisols</td>
<td>1. Artesols</td>
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<tr>
<td>2. Histosols</td>
<td>2. Gelisols</td>
</tr>
<tr>
<td>3. Spodosols</td>
<td>3. Histosols</td>
</tr>
<tr>
<td>4. Andisols</td>
<td><strong>Aquasols</strong></td>
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<tr>
<td>5. Oxisols</td>
<td>5. Spodosols</td>
</tr>
<tr>
<td>6. Vertisols</td>
<td>6. Andisols</td>
</tr>
<tr>
<td>7. Aridisols</td>
<td>7. Oxisols</td>
</tr>
<tr>
<td>8. Ultisols</td>
<td>8. Vertisols</td>
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<tr>
<td>10.Alfisols</td>
<td>10.Ultisols</td>
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<tr>
<td>11.Inceptisols</td>
<td>11.Mollisols</td>
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<tr>
<td>12.Entisols</td>
<td>12.Alfisols</td>
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<tr>
<td></td>
<td>13.Inceptisols</td>
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<tr>
<td></td>
<td>14.Entisols</td>
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</tbody>
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**Aquasols**

-- formative element = aq,
-- pronounced “Ack Wa Sols”

A wet soil is one that the water table comes to the soil surface and stays there long enough to severely alter the soil morphology and impact the use and management of the soils. In this proposal, we are defining this as having aquic conditions within a depth of 30 cm or less from the soil surface.
Keys to the Suborders

1) **Wassaqs** -- water over the soil surface continuously -- subaqueous soils;

2) **Peraqs** -- water levels that stay at or near the soil surface all year long; peraquic;

3) **Leptaqs** -- have a root-restrictive feature within 100 cm of the soil surface.

4) **Vertaqs** -- that have a layer 25 cm or more thick, within 100 cm of the mineral soil surface, that has either slickensides or wedge-shaped peds that have their long axes tilted 10 to 60 degrees from the horizontal.

5) **Humaqs** – have a histic, mollic, or umbric epipedon.

6) **Psammaqs** – have a sandy particle size class in all of the upper 100 cm of the soil.

7) **Argaqs** – have an argillic horizon.

8) **Orthaqs** – other Aquasols.
Keys to the Wassaq Great Groups

1) Wassaqs -- water over the soil surface continuously -- subaqueous soils;

1.1. **Fluiwassaq**: have fluid material that extends at least 20 cm from the soil surface

1.2. **Sulfiwassaq**: have sulfidic materials within 50 cm of the soil surface

1.3. **Psammowassaq**: texture class of loamy fine sand or coarser in all layers in upper 20 cm

1.4. **Humiwassaq**: histic, mollic, umbric, or melanic epipedon

1.5. **Haplowassaq**: other Wassaqs
Keys to the Peraq Great Groups

2) Peraq -- water levels within 25 cm of the soil surface at least 9 months of the year; peraquic;

2.1. **Sulfoperaq**: sulfuric horizon within 50 cm of the soil surface;
2.2. **Sulfiperaq**: sulfidic materials within 50 cm of the soil surface;
2.3. **Saliperaq**: saline within 50 cm of the soil surface;
2.4. **Fluiperaq**: have fluid materials in the upper 30 cm;
2.5. **Humiperaq**: histic, mollic, umbric, or melanic epipedon present;
2.6. **Psammoperaq**: sandy textures throughout the upper 100 cm;
2.7. **Fluviperaq**: have an irregular decrease in organic-carbon content;
2.8. **Haploperaq**: All other Peraqs.
Keys to the Leptaq Great Groups

3) Leptaqs -- have a root-restrictive feature within 100 cm of the soil surface

3.1. **Petroleptaq**: Leptaqs that have a cemented layer (excluding a lithic contact) within 100 cm of the soil surface;

3.2. **Fragileptaq**: Leptaqs that have a fragipan within 100 cm of the soil surface

3.3. **Plintholeptaq**: Leptaqs that have a >5 percent (v/v) plinthite within 100 cm of the soil surface;

3.4. **Densileptaq**: Leptaqs that have a densic contact within 100 cm of the soil surface;

3.5. **Litholeptaq**: Leptaqs that have a lithic contact within 100 cm of the soil surface;

3.6. **Haploleptaq**: All other Leptaqs that have a root-restrictive layer (e.g. paralithic contact, silcrete, alcrete, clay pan) within 100 cm of the soil surface.
DBB Sulfiperaq Subgroups

DBBA Sulfiperaqs that have, in some horizons at a depth between 20 and 50 cm below the mineral soil surface fluid, moderately fluid, or very fluid soil materials. (Broadkill)

DBBB Other Sulfiperaqs that have a histic epipedon. (Matunuck)

DBBC Other Sulfiperaqs that have a mollic epipedon $\geq 60$ cm thick.

DBBD Other Sulfiperaqs that have a mollic epipedon.

DBBE Other Sulfiperaqs that have a buried layer that meets criteria for a histic or mollic, epipedon within 200 cm of the soil surface; or have a combined thickness of buried surfaces, A and O horizons, that is 20 cm or more thick within 200 cm of the soil surface. (Appoquinimink)

DBBF Other Sulfiperaqs that have less than 35 percent coarse fragments and a texture of loamy fine sand or coarser in all layers within the particle-size control section. (Sandyhook, Demariscotta)
What we would like from you

Any comments on the proposal

Specifically:

• have any soils been left out of the classification that you know of
• are there subgroups that don’t exist but are recorded here

Send comments to me (mstolt@uri.edu) or to your Soil Taxonomy Committee chairs  wayne.gabriel@usda.gov
MATTHEW.LEVI@uga.edu