Proposal to Change the Reaction Classes for the Family Differentiae for Organic Soils in the Keys to Taxonomy

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Background:

Throughout the history of Soil Survey in the United States, Organic soils have not been considered a high priority. Most emphasis has been placed on agricultural soils. Even in recent years with legislation to protect wetlands (Food Security Act of 1985, Clean Water Act, etc.) most interest has been with conversion of wetlands into agricultural land use.

In Soil Classification, the 7th Approximation¹, “No definite proposals for the classification of Histosols are made at this time. Instead, we will outline, with their advantages and disadvantages, the two proposals that are being considered. One proposal is to classify the Histosols in the higher categories on the nature of their genetic horizons and in the lower categories on the nature of their other properties.

The decomposition of the surface layers produces a dark-colored, finely divided muck of varying thickness. It is possible to define at least two such horizons, one that is comparable to the mollic epipedon in its properties, and the other comparable to the umbric epipedon. The first has a high base saturation, a pH of more than 5, and carbon-nitrogen ratios of less than 17. The second is more acid or has carbon-nitrogen ratios of more than 17. The thickness that is necessary for these horizons has not been determined, but it must be an arbitrary thickness. It probably should be somewhere between 15 and 30 cm...”

According to Guy Smith² “The criteria pH was not considered at the time of the development of Soil Taxonomy, rather than base saturation that I know of. pH was considered but it didn't get written into any definition, except as it appears in the definitions of the Sulfaquepts. At the family level, we have some pH limits for Histosols and so on. But otherwise, we have kept pH out. The pH is quite a variable thing with respect to base saturation, and it varies quite a bit from one place to another. It depends on when you take your sample, what the pH is going to be. It can have half a unit, or occasionally even a unit, variability with the season. Some of the most careful studies have been on Histosols in Finland where they found the pH varying practically one unit seasonally. I think Michigan has some studies of this sort.”

It wasn’t until the first edition of Soil Taxonomy, 1975³ that reaction classes for Histosols were identified and defined. These criteria have remained the similar since conception:

“Reaction classes
Modifiers to indicate reaction are used in all subgroups. The meanings follow.
Euic.-The pH of undried samples is 4.5 or more (0.01 M CaCl2) in at least some part of the organic materials in the control section.
Dysic.-The pH is <4.5 (in 0.01 M CaCl2) in all parts of the organic materials in the control section.”
**Issue:**
It is very common for the pH in organic soils to fluctuate throughout the year depending on seasonal hydrologic changes during recharge periods in spring snow melt and fall plant dormancy. It is very common for most acidic organic soils to have pH ranges exceed 4.5 at depth and not meet the Dysic criteria even if the organic material supports low base, acid tolerant vegetation, such as black spruce, leather leaf, bog laurel, blueberry, cranberry, etc.

A state of Minnesota peat inventory of the major organic soils in the state reveled that half of the soils sampled that were mapped as dysic soils had a pH of 4.5 or higher within 130 cm of the soil surface and did not meet the dysic reaction class criteria.

Calcareous fens are also left out of the taxonomic criteria and out of reaction class. These are highly protected areas and unique enough to be distinguished from Euic reaction class. Series established for calcareous fens are not easily identified in taxonomy.

**Proposal:**
- Add a calcareous reaction class for organic soils.
- Changing the reaction classification order to split out the dysic and calcareous classes from the Euic class.
- Propose changing the depth for pH requirement to upper 60cm for the dysic reaction class since most vegetation in acid bogs have sallow rooting systems less than 50cm. This is also addressed in an additional proposal to modify the concepts of tier depths and control section for organic soils.
- Propose adding 90 percent or more acid vegetation coverage to the criteria for dysic reaction class. Although this maybe subjective as to what is acid tolerant verses shade intolerance or vegetation that can compete in low nutrient environments such as pitcher plant. This will ensure proper correlation to ecological site concepts.
- Consider changing the pH limit for dysic reaction class from less than 4.5 to less than 5.0 and adding carbon/nitrogen ratios of more than 17 as proposed in the 7th Approximation. These two additions would have a considerable impact and need additional investigation and are not currently part of the proposed taxonomy changes.

**Change the reaction class for organic soils FROM:**

Reaction classes are used in all families of Histosols and Histels. The two classes recognized are defined in the following key:

A. Histosols and Histels that have a pH value, on undried samples, of 4.5 or more (in 0.01 M CaCl₂) in one or more layers of organic soil materials within the control section for Histosols.

**Euic**

or

B. All other Histosols and Histels.

**Dysic**

**TO:**

Change the reaction class for organic soils FROM:
Reaction classes are used in all families of Histosols and Histels. The classes recognized are defined in the following key:

A. Histosols and Histels that have a pH value, on undried samples, less than 4.5 (in 0.01 M CaCl₂) throughout upper 60cm of the soil surface and have 90 percent or more coverage of acid tolerant vegetation, such as, black spruce, tamarack, bog rosemary, cranberry, blueberry, labrador tea, laurel, pitcher plant, leatherleaf, sphagnum mosses, etc.

Dysic
or
B. Histosols and Histels that do not have limnic materials but effervesce (in cold dilute HCl) in some part of the control section for Histosols.

Calcareous
or
B. All other Histosols and Histels.

References:


4. Inventory of Peat Resources Aitkin County, Minnesota, 1982, Minnesota Department of Natural Resources, Division of Minerals, Peat Inventory Project, Hibbing MN.

Inventory of Peat Resources An Area of Beltrami and Lake of the Woods Counties, Minnesota, 1984, Minnesota Department of Natural Resources, Division of Minerals, Peat Inventory Project, Hibbing MN.

Inventory of Peat Resources Koochiching County, Minnesota, 1980, Minnesota Department of Natural Resources, Division of Minerals, Peat Inventory Project, Hibbing MN.

Inventory of Peat Resources SW St. Louis County, Minnesota, 1979, D. J. Olson, T. J. Malterer, D. R. Mellem, B. Leuelling, and E. J. Tome, Minnesota Department of Natural Resources, Division of Minerals, Peat Inventory Project, Hibbing MN.