Problem Red Parent Material Soils in Western and Central New York

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The classic red parent material soils are those that developed in residuum over Triassic red beds. In Western and Central New York we do not have soils that developed in residuum because Wisconsin glaciation, which retreated 8,000 to 12,000 years ago, changed our landscapes so profoundly (there is an area primarily in southern Cattaraugus County called the Salamanca Reentrant that is relatively unglaciated), and no Triassic age red beds (there are some in the lower Hudson Valley). We do however have soils that developed in red parent materials. These parent materials represent glacial drift and old lake beds, the sediments transported by the glacier as it overrode and ground down reddish rock formations like the Queenston Formation, The Furnaceville Formation, The Medina Formation, and the Vernon Shales.

Dr. Martin Rabenhorst, University of Maryland has developed a Color Change Propensity Index based on a chemical test. The Propensity Index test can determine if the red color in a soil is due to iron compounds that are resistant to reduction. We sent some samples in from Niagara County and they tested out very resistant, in fact they were as resistant as some other soils over Triassic red beds. That was from Niagara County, other samples should be sent in from elsewhere in New York State where problem red soils are suspected to exist.

Aside from using professional judgment there are several field indicator tools available for identifying these problem soils as hydric. All of these tools use the surface horizon

One tool very easily overlooked is the F3 indicator. It reads as below:

F3 Depleted Matrix. For use in all LRR's except for W,X, and Y. A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or

b. 15 cm (6 inches) starting within 25cm(10 inches) of the soil surface.

Depleted matrix from the glossary:

1. A layer with 5 or more value, 1 or less chroma with or without accumulations, or
2. A layer with 6 or more value, 2 or less chroma with 2 percent or more distinct or prominent redoximorphic accumulations, or
3. A layer with 4 or 5 value, 2 chroma with 2 percent or more distinct or prominent redoximorphic accumulations, or
4. *A layer with 4 value, 1 chroma with 2 percent or more distinct or prominent redoximorphic accumulations.*

In many old fields that have been abandoned or are just used for hay or forage presently, where at some time in the past they were used for tilled crops there is an A horizon

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developing in an old Ap. The A horizon is manifested as a 3 to 4 inch dark horizon at the surface with good granular structure with many fine roots in the interstices of the structural aggregates, or peds. The relict Ap horizon extends below that to 8 or 10 inches and has blocky structure. Very often the Ap horizon may be a color chip higher in value than the A horizon and be 1 chroma and have a gray appearance. If the A horizon is a 3/2 which is fairly common, the Ap horizon might be a 4/1 and have 2 percent or more redoximorphic accumulations. If it is 6 inches or more thick and it starts within 10 inches it would satisfy alternative "b" of the indicator and alternative 4 of a depleted matrix. Also if it 2 inches thick and the 2 inches is entirely within the upper 6 inches it would satisfy condition "a" of the indicator and also alternative 4 of the depleted matrix.

A11. Depleted Below Dark Surface.
A layer with a depleted or gleyed matrix that has 60 percent chroma of 2 or less starting within 12 inches of the soil surface, and having a minimum thickness of either 6 inches, or 2 inches if it consists of fragmental material. Loamy or clayey materials above the depleted or gleyed matrix must have value of 3 or less and chroma of 2 or less. Any sandy material above the depleted or gleyed matrix must have value of 3 or less and chroma of 1 or less and at least 70 percent of the visible soil particles must be covered, coated, or similarly masked with organic material.

The surface layer of the soil must be 3/2 for loamy and clayey materials, and 3/1 for sandy materials (at least 70% of individual sand grains must be coated). The depleted layer below it must be 60% or more chroma 2 or less, be at least 6 inches thick (for fragmental soil material minimum thickness is 2 inches) and begin within 12 inches.

Again: Depleted matrix from the glossary:
A layer with 5 or more value, 1 or less chroma with or without accumulations, or
A layer with 6 or more value, 2 or less chroma with 2 percent or more distinct or prominent redoximorphic accumulations, or
A layer with 4 or 5 value, 2 chroma with 2 percent or more distinct or prominent redoximorphic accumulations, or
A layer with 4 value, 1 chroma with 2 percent or more distinct or prominent redoximorphic accumulations.

Returning to the common case of the abandoned pasture or old field described under F3 above. For F3 the depleted matrix must begin within 10 inches, for A11 it can begin within 12 inches. Whether F3 is chosen or A11, a depleted matrix remains the same. Again, if the soil is a problem red parent material soil it may be the low value surface that holds the key with respect to determining whether it is hydric.

A12 . Thick Dark Surface
A layer at least 6 inches thick starting below 12 inches of the surface with a depleted or gleyed matrix that has 60 percent or more chroma of 2 or less.
The layers above the depleted matrix must have value of 2.5 or less and chroma of 1 or less to a depth of 12 inches and value of 3 or less and chroma of 1 or less in any remaining layers above the depleted matrix. Any sandy material above the depleted

or gleyed matrix must have at least 70 percent of the visible soil particles covered, coated, or similarly masked with organic material.

In the field for what ever reason, and there are abundant natural and anthropogenic ones, one sometimes encounters surface layers that are quite thick, sometimes approaching 20 inches thick. If such a surface layer is dark enough, value of 2.5 or less and chroma of 1 or less to a depth of 12 inches, and below that value of 3 or less and chroma of 1 or less to a depleted matrix, even if the depleted matrix is quite deep, the soil satisfies the A12 indicator.

Again it may be that the bottom of the organic rich zone, the A horizon satisfies a depleted matrix: *A layer with 4 value, 1 chroma with 2 percent or more distinct or prominent redoximorphic accumulations.*

F6. Redox dark surface
A layer that is at least 4 inches thick, is entirely within the upper 12 inches of the mineral soil and has:
a. Matrix value of 3 or less and chroma of 1 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings, or
b. Matrix value of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

F6 is another indicator tool that relies on the surface layer. This indicator is predicated on a 4 inch thick or greater layer entirely within the upper 12 inches of soil with a value of 3 or less. If it has chroma of 1 or less it has 2 percent or more distinct or prominent redox concentrations. If it has chroma of 2 or less it has 5 percent or more distinct or prominent redox concentrations.

F7. Depleted Dark Surface
Redox depletions with a value of 5 or more , and chroma of 2 or less in a layer that is at least 4 inches thick, is entirely within the upper 12 inches of the mineral soil and has:
a. Matrix value of 3 or less and chroma of 1 or less and 10 percent or more redox depletions or
b. Matrix value of 3 or less and chroma of 2 or less and 20 percent or more redox depletions.

F7 is similar to F6 except the redox features are depletions with a value of 5 or more and chroma of 2 or less, rather than accumulations, and the percentages are different. Where F6 requires 2 percent, F7 requires 10 percent, in the second case, value of 3 and chroma of 2, where F6 requires 5 percent or more redox accumulations, F7 requires 20 percent redox depletions.

There are unquestionably red parent material soils in Western and Central New York that are problems for identification. In a last resort scenario, in order to properly identify these soils as hydric it may be necessary to use professional judgment. However, one advantage that the Field Indicators of Hydric Soils in the United States have over the USACE 1987 Wetland Delineation Manual with respect to the proper identification of these soils are indicators F3, A11, A12, F6 and F7 which dwell more on characteristics of the surface soil than the subsoil. Even a depleted matrix, which is normally thought of as a subsoil horizon, can in the 4th alternative be part of a surface soil horizon. Using the surface horizon to classify these soils has certain advantages. Number one is that the surface horizon is the most weathered, and resistant iron molecules can be expected to be in a more advanced state of decay and weathering. Number two is that there is a lot of food (organic matter) for the microbes to eat so there is a lot of pressure for the iron to accept electrons and thus reduce. When the water table subsides there is a great amount of surface area for the ferrous ions to be trapped on and then oxidized when air again fills the pore spaces.