SOIL SURVEY TECHNICAL NOTE

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Soil Moisture Status In the National Soil Information System

Purpose of this technical note

Soil moisture patterns in soils are represented by the National Soil Information System (NASIS) database entries of soil moisture status by month and depth. Several questions have been raised concerning populating the data. This technical note attempts to answer those concerns.

Soil moisture status by depth and month provides data and estimates that are useful for the following:

1. Interpretations related to crop growth, installation of conservation practices, susceptibility to compaction, ease of excavation, hydric soils, agricultural waste, and many others.
2. Models make predictions that require information on soil moisture.
3. Consistent classification of soils often depends on an inference of soil climate based on vegetation and/or atmospheric climate. Soil moisture status and temperature are recorded observations or estimates to allow placement of soils into soil moisture and temperature regimes. Some soils have the same soil moisture regime, but are moist and dry at different times of the year. For example, some soils in an ustic soil moisture regime receive adequate spring moisture for crop production, while other soils in an ustic soil moisture regime are dry in the spring and are used as rangeland. The soil moisture data can be used to make series separations.
4. Crop insurance agencies use the information for risk management.

To accommodate these needs, a database to aggregate soil moisture data is needed. Resources spent on moisture studies warrant data storage.

Background

Conversion of the State Soil Survey Database (SSSD) to the National Soil Information System (NASIS)

When data on depth to the water table were converted from SSSD to NASIS, the depth range in SSSD was entered as the range in depth to the top of a soil moisture layer, and a soil moisture status of wet was entered for that layer for each of the months when the water table was likely to occur. The water table was assumed to be apparent, unless indicated as perched. For the part of the soil below the water table, a soil moisture status of wet was entered for the zone extending to the bottom of the soil. Pre-conversion queries to states were made to address issues related to soils having a perched water table. Because only wet was entered, entries for moist and dry are needed to provide complete information.

Since NASIS stores moisture data by individual map unit components, entries for soil moisture can be more specific than water table entries on Soil Interpretation Records (Soils Form 5) that were used for a broad range of components.

Ponding previously was handled with the water table entry. NASIS established a separate entry for ponding by month and depth. Flooding was always a separate entry and continues to be so, although the format for entries was changed.

Entering Soil Moisture Information

Three water state classes (dry, moist, and wet) are used as soil moisture status entries for map unit components. They are defined in part 618.57 of the *National Soil Survey Handbook* and included in the National Soil Information System (NASIS). These classes are for component data.
The classes for Component Soil Moisture Status are defined as follows:

Dry	> 15 bar suction
Moist	≤ 15 bar to ≥ 0.00001 bar
Wet	< 0.00001 bar; free water present (satiated wet)

Guiding Concepts

- The intent is to describe a soil moisture profile. Layer depths may or may not be the same as horizon depths in the component horizon table. Layers define the zone having the same soil moisture state. If the soil is wet throughout 0 to 200 cm, then one entry (wet) is made for 0 to 200 cm for that month.
- For frozen soils, enter the appropriate soil moisture state when the soil is thawed. For example, if the soil is frozen and dry when thawed, enter dry.
- The layers can be subdivided into various soil moisture states as needed, but remember that these are monthly averages for the extent of the component across the landscape.

- The entries are expected to come from the best estimates that local knowledge can provide. If local knowledge is supported by data, so much the better. The information as aggregated data is not expected to be exact but to be generalized and to reflect an average condition.
- Entries for RV should reflect the conditions of a “normal year."
- Make entries for each month by layer. Enter the condition that dominates for the month. This is the condition for more than 15 days on the long-term average. The low and high values represent the depth range within the component for the normal year; they are not to represent the extremes, such as years of drought.
- If the depth to free-water fluctuates during the month, use the depth for the average between the high and low level.
- Enter only one moisture state within a given layer.

Examples of entries for different moisture regimes are attached.

Estimating Soil Moisture Information

Every soil is subject to extremes in weather. The moisture status of the soil must be characterized by probability. Long-term weather patterns of precipitation, temperature, and wind are helpful in estimating soil moisture status but must be tempered by topography, landscape position, slope, aspect, surface condition, infiltration, soil structure, available water capacity, internal water movement restrictions, vegetation, and land use. Accumulation of snow affects the amount of moisture provided to the soil and also impacts soil temperature and frost depth.

Soil moisture data can be obtained from several sources. Check for soil moisture studies and piezometer measurements in dissertations and other university studies, scientific papers, or in Natural Resources Conservation Service project reports. Some global change studies include soil moisture data. Newhall and other computer models may be helpful. For most soils actual data are not available and entries will be based on observations, field notes, and climatic data from the area.

The “*Soil Survey Manual*,” pages 94-95, provides guidance on evaluating soil moisture by color and feel.

EXAMPLE WORKSHEETS

SOIL MOISTURE STATE BY MONTH AND DEPTH

Aridic Thermic

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Ppt (mm)	10	10	8	4	6	2	8	10	6	4	8	8
0 SOIL DEPTH 200 cm	M D	M D	M D	M D	D	D	D	D	D	D	D	M D

SOIL MOISTURE STATE BY MONTH AND DEPTH

Xeric Mesic

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Ppt (mm)	180	140	110	60	40	30	10	20	40	80	170	200
0 SOIL DEPTH 200 cm	M W	M W	M W	M	M	D M	D M	D M	M D M	M	M	W

SOIL MOISTURE STATE BY MONTH AND DEPTH

Ustic Mesic

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Ppt (mm)	10	15	50	60	80	100	70	70	70	40	25	15
0 SOIL DEPTH 200 cm	M D M	M D M	M D M	M	M	M	D M	D M	D M	M D M	M D M	M D M

SOIL MOISTURE STATE BY MONTH AND DEPTH

Udic Mesic

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Ppt (mm)	50	60	80	80	100	100	110	90	70	50	80	70
0 SOIL DEPTH 200 cm	M W	M W	M W	M W	M W	M	M	D M	D M	M	M W	M W