

Natural Resources Conservation Service

Soil Science Division

Soil Survey Region 5



Pierre, South Dakota, Soil Survey Office

Soil Sampling at South Dakota State University Mesonet Stations

Purpose

Over the summer, a sampling project was conducted to provide site-specific soils data for calibration of the South Dakota State University (SDSU) Mesonet weather stations. The impetus for the soil sampling was the Upper Missouri River Basin Plains Snow and Soil Moisture Monitoring Project. The aim of the project, led by the U.S. Army Corps of Engineers, is to improve reservoir management by improving data available to National Oceanic and Atmospheric Administration (NOAA) for the estimation of snow water equivalent and soil moisture. The NOAA snow water model will be able to use plasticity and bulk density values. The NOAA river forecast model relies on content of “free water” and “tension water” in upper and lower layers to determine runoff. Values of curve number, bulk density, field capacity, and wilting point are used to translate volumetric water content at depths of 2, 4, 8, 20, and 40 inches into these terms.

Key Outcomes

Thirty-four sites across South Dakota were sampled for full laboratory characterization and sent to the Kellogg Soil Survey Laboratory in Lincoln, Nebraska. The crew sampled under a tight timeline, fought poor weather conditions, including many wetter than normal sites, and even sampled in a landfill. The majority of sites were sampled by the Pierre, South Dakota, MLRA Soil Survey Office (Andrew Oxford and Matti Osterman) with assistance from South Dakota Mesonet (Nathan Edwards, Ruben Behnke, and Miguel Mena), the Redfield Soil Survey Office (Lance Howe and Steve Winter), and South Dakota NRCS soil scientists (Nathan Jones, Andrew Champa, and Craig Veldkamp). The soils were sampled between 50 to 100 feet from the weather station so as not to disrupt the station’s monitoring. Outcomes of this project include 34 pedons sampled within 5 weeks, 550 bulk density clods collected, and 195 horizons described.

The project will impact how data can be displayed to the public on the South Dakota Mesonet website (<https://mesonet.sdstate.edu>). Currently, values can be displayed only in terms of volumetric water content (figure 1). South Dakota Mesonet would like to take this a step further and display in terms of plant-available water. Wilting point, field capacity, and saturation obtained from the soil survey have not been accurate enough to make this possible, and other methods require long periods of record that are not available from all Mesonet stations. The results from the analysis of the soil samples by the Kellogg Soil Survey Laboratory (KSSL) will allow this to be done accurately. South Dakota Mesonet envisions a four-color “poker chip” map (red=below wilting point; yellow=0–50% available water capacity; green=50–100% available water capacity; and blue=>field capacity).



Displaying information in this manner will benefit those in agriculture, drought monitor authors, and water resource managers. It will also benefit anyone concerned with flooding, from the homeowner to the professional hydrologist. This collaboration between SDSU and NRCS will significantly improve the utility of South Dakota Mesonet soil moisture data.

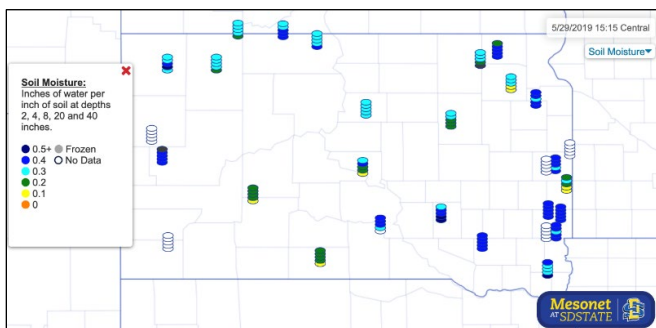


Figure 1.—SDSU Mesonet soil moisture map in South Dakota.

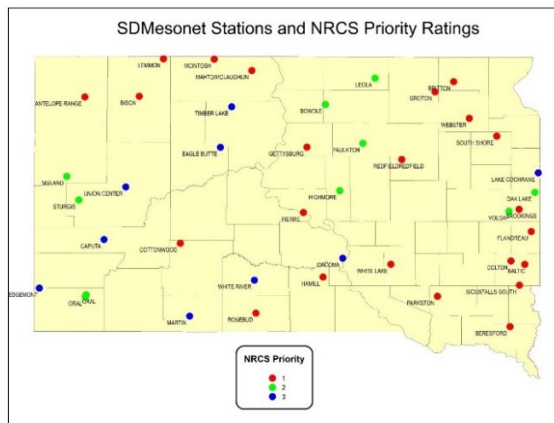


Figure 2.—Distribution map of SDSU Mesonet stations in South Dakota.



Figure 3.—Antelope Range Mesonet Station. Miguel Mena (SDSU Intern) and Andrew Oxford (Soil Scientist).



Figure 4.—Dakota Lakes Mesonet Station. Miguel Mena, Ruben Behnke (SDSU Mesonet), and Nathan Jones (State Soil Scientist).



Figure 5.—McIntosh Station. Matti Osterman (Soil Scientist).