



Soil and Plant Science Division

Technical Soil Services

Northwest Soil Survey Region



Basics of Soils With University of Montana-Western Students

Dillon, Montana, Major Land Resource Area (MLRA) Soil Survey Office (SSO), MLRA 43B—Central Rocky Mountains

Purpose

In September 2025, the Dillon, MT, MRLA SSO responded to a request from Dr. Lorrie Carnes, a surficial geology professor at the University of Montana-Western (UMW). Dr. Carnes asked Ben Moore (MLRA SSO leader) and Tess Wolf (soil scientist) to teach basic soil descriptions to students in a basics of soils class. During the 2 days of teaching, Moore and Wolf presented an overview lecture and took students to practice describing soils in various ecological zones.

Background

Soil survey staff have previously assisted in environmental science courses at UMW, including lecturing on GIS and field instruction for hydric soils. For this class, Moore presented a brief lecture on the history and process of soil survey. He then led students to a broad road cut to introduce them to the process of describing soils. Moore covered basic physical and chemical properties, referencing the “Field Book for Describing and Sampling Soils” for description. After lunch, students split into groups to practice their first soil description. Moore, Wolf, and Dr. Carnes watched the students work and answered questions about soil structure, soil pH calibration, and texture classes. Students collected soil samples to use for future laboratory exercises, such as nutrient testing and particle-size analysis.

A week later, students joined Moore and Wolf in the field to describe samples near Argenta, MT, where a variety of ecological sites and soils exist in proximity. Moore and Wolf divided students into two groups. Wolf led one group to a mining cut on a southwest-facing rangeland site to describe the soil and discuss clay films, identifiable carbonates, and contact with bedrock. Moore's group described two pits: a wet, mucky, riparian soil and a dry riparian soil. The students learned about organic soil materials and redoximorphic features (i.e., mineral changes due to fluctuating water levels). After lunch, Wolf's group visited a steep, forested site (fig. 1) with an E horizon and buried charcoal. Moore took students to a flat aspen site (fig. 2), which gave students an opportunity to describe a Mollisol and discuss land management practices that support aspen growth. Throughout the day, students collected samples to use for laboratory exercises.



Figure 1.—Students gather around forested soil pit to delineate horizons.



Figure 2.—Students describe soil properties in an aspen stand.

Key Outcomes

After two full days of instruction, Moore and Wolf ended the class by emphasizing that students should always evaluate their field observations with their knowledge of local soil forming factors to validate the observations. The UMW students applied their newly gained knowledge to independent final projects, and many commented on the applicability and relevance of the knowledge to their future careers in environmental sciences. By continuing to offer support when requested, the Dillon MLRA SSO builds and strengthens relationships with universities and cooperators through a mutually beneficial exchange of ideas, knowledge, and resources.

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