Soil and Plant Science Division

Technical Soil Services

Northwest Soil Survey Region

Field Tour for University Staff

Major Land Resource Area (MLRA) 43B—Central Rocky Mountains

Purpose

The University of Montana-Western (UMW) in Dillon, MT, offers a basic soils course every other fall. The new professor teaching the class sought field time to learn more about soil processes and properties unique to the area to help prepare for the class. Dr. Lorrie Carnes, a surficial geology professor, contacted the Dillon, MT, MLRA Soil Survey Office (SSO) Leader Ben Moore and asked Moore to put together options of local field tours that would highlight the diverse soils in the area. Additionally, the Dillon, MT, MLRA SSO staff were able to observe soils, plants, and geomorphology in a different part of their MLRAs during the field tour.

Background

UMW offers classes on a block schedule, including a series of field-intensive classes in the environmental and geological sciences. Dillon MLRA SSO staff have built a relationship with faculty members by often presenting information in the classroom or field for students. Topics have ranged from soil description, basic geomorphology, soil mapping, and wetland processes. Because UMW does not offer the basic soils class annually, professors rotate teaching it, allowing for a variety of field exercises and topics to be learned, based on the professor's specialty.

On June 30, Moore, Dr. Carnes, and Soil Scientist Tess Wolf toured an area in the northeast portion of the Pioneer Mountains. The first stop was in a flood plain along the Big Hole River. Moore and Wolf discussed site indicators and how these informed soil processes and properties, such as organic matter accumulation and fluctuating water tables. This led to a discussion of organic versus mineral soils, soil transformations and translocations, and textural modifiers.

The three continued west to find some road cuts in the rangeland. Moore and Wolf pointed out erosion and overgrazing impacts on soils, calcium carbonate features in soils, and accumulations and losses of other soil minerals, including clays.

They also stopped to see a mudstone outcrop with various deformations. Where Moore and Wolf saw the importance of the bedrock for land management decisions, Dr. Carnes explained how the size of the bedrock units indicates the amount of heat and pressure at the time of formation.

At the next stop, they began to discuss glacial (soil moved by ice into new landforms) and colluvial (soil moved by gravity) processes, which provided insight into the differences in soil formation and geologic interests. Dr. Carnes noted that the landforms were created by ice moving soil material; Moore and Wolf mentioned that more recent impacts of gravity have the dominant influence on soil formation.

Following the discussion, the three continued to a high-elevation meadow where they dug a soil pit and discussed the impact of snow and wind on flat, high-elevation sites (fig. 1). The higher elevation exposes the land to higher wind speeds, which limits tree growth and can redistribute snow into sheltered pockets on the land. Despite lower landforms being clear evidence of glaciation, this flat ridge lacked typical evidence. This incited further discussion on other soil processes acting on previously glaciated landforms. These ridges experienced carving by glacial ice, but the soils are influenced by more recent processes, such as wind erosion and deposition, or freeze-thaw cycles (water in the soil freezing and thawing, causing the soil to expand and contract).

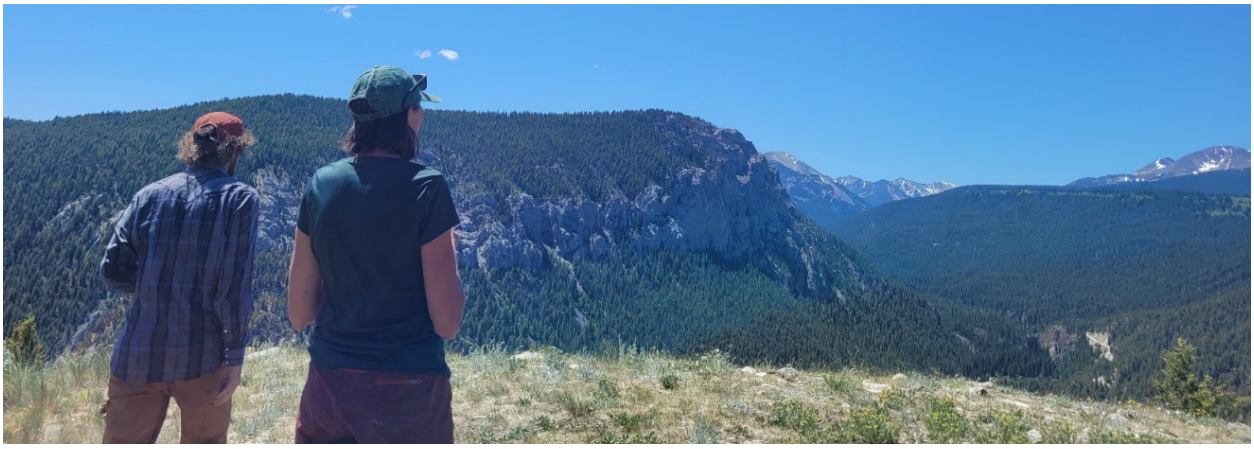

Figure 1.—Ben Moore from NRCS and Dr. Carnes from the University of Montana-Western discuss colluvial and glacial processes while looking out over a glacial valley.

The final stop of the day was a road cut on a forested, north-facing slope. Dr. Carnes, Moore, and Wolf discussed the differences in this soil pit, as well as the similarities, and the site factors that caused these. For example, the lighter colors that appeared deeper in the soil pit reflect colors of parent material, as there is very little precipitation on this unstable site to promote significant soil development (fig. 2).

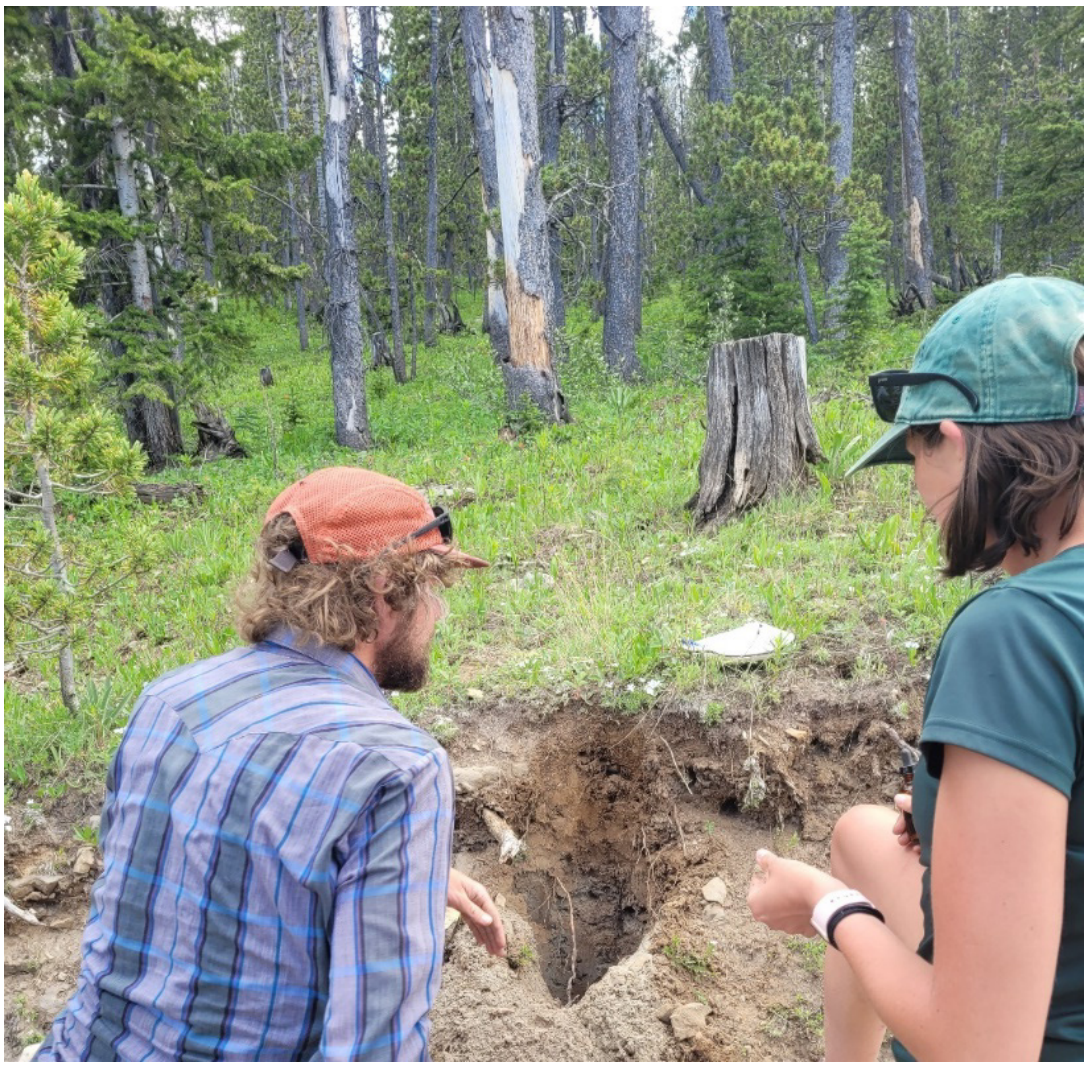

Figure 2.—Moore and Dr. Carnes discuss a forested soil profile.

Key Outcomes

Overall, it was a successful field tour filled with discussion, and it reinforced the cooperative relationship between UMW and Dillion, MT, MLRA SSO staff. In addition to providing responses and resources related to Dr. Carnes' questions, Moore and Wolf agreed to possibly do a field day with the students.