Soil Depth and Development as Related to Aspect in the Nebraska Pine Ridge

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The Pine Ridge is an eroded, tree-covered escarpment in northwestern Nebraska. It is the boundary between the High Plains physiographic province to the south and the Missouri Plateau to the north. The Pine Ridge in Nebraska forms a rough arc approximately 80 miles (130 km) long extending from the Wyoming border through Nebraska into southern South Dakota (Fig. 1). Elevation differences from the top to the base typically are 500 to 600 feet (152–183 m). Elevations at the eastern end of the escarpment in Sheridan County, NE, are 3,800 to 4,000 feet (1,158–1,219 m) while at the western end in Sioux county, NE they are 4,900 to 5,100 feet (1,494–1,555 m).

The climate is semiarid. Precipitation averages 18 inches (46 cm) per year in the western end of the Pine Ridge, while at the eastern end the average precipitation is 18 to 20 inches (46–51 cm) per year (Souders et al., 1980).

The dominant member of the Pine Ridge plant community is the ponderosa pine (Pinus ponderosa). Density of the pine trees is much greater on the north-facing slopes (north slopes) than on the south-facing slopes (south slopes) (Nixon, 1967). This difference is a result of the more moist and cooler microclimate found on the north slopes. Soil scientist and foresters who have worked in the Pine Ridge have generally accepted the fact that the soils on the north slopes are deeper and more developed than soils on the south slopes. This study was designed to begin to quantify those differences.

Methods

A series of transects were run on north and south slopes at selected sites in Dawes, Sheridan, and Sioux Counties, NE. Dawes County has a published soil survey and those soil maps were used to pick the transect sites in that county. Sheridan County and Sioux County have soil surveys in progress and as I have worked on both I examined the aerial photographs and consulted the USDA-SCS soil survey party leaders for ideas on transect sites in those counties.

The transects were run straight up and down slope and the sampling interval was 20 feet (6 m). Landscape position at all of the sampling sites was described as sideslope (Ruhe, 1969). The sideslope designation was then further broken down into upper sideslope (USS), mid-sideslope (MSS), and lower sideslope (LSS). Soil properties recorded were depth to rock, aspect, horizon development, horizon thickness, depth to carbonates, slope, and texture. These were described using Chapter 4 of the Soil Survey Handbook (USDA, 1981). The data were analyzed to determine mean depth to rock, mean depth to carbonates, and percent of profiles with Bt horizons. These analyses were performed for the entire north and south slopes, and for each landscape position subunit on the north and south slopes.

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