

THE DISTRIBUTION OF LITTLE BLUESTEM ON CERTAIN SOILS IN MELLETTE COUNTY, SOUTH DAKOTA¹

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INTRODUCTION

Little bluestem (*Andropogon scoparius*) is a vigorous, erect, warm season, perennial bunchgrass that is widely distributed over the United States. Weaver and Albertson (11) note that little bluestem communities are established on rocky hillsides, steep protected slopes of rough lands, and ravines where excess moisture from snow and rain accumulate. Shantz (9) indicates this bunchgrass occurs only where soil moisture is adequate at considerable depths. Tolstead (10) and Mentzer (7) claim little bluestem communities are found predominantly on north-facing slopes protected from south winds and direct rays of sunshine. In contrast, Archer and Bunch (1) report little bluestem to be adapted to poor, droughty sites, such as gravelly soils, ridges, and other exposed locations. Griffiths, 1893, (3) states that it is one of the principal grasses of the dry-side slopes in western South Dakota. This is in agreement with Hoover, *et al.* (4), who relate that this grass is adapted to sites that "receive limited moisture." McMillan (6) in a study of flowering behavior within two grassland communities under reciprocal transplanting was able to separate genetic and habitat effects of nine taxa, including little bluestem. Ecotypic variants were found within each of the species. In order to study the soil-topography relationship to the distribution of little bluestem in Mellette County, South Dakota, field notes were taken at little bluestem sites. If this relationship is well-understood, it is often possible to use a plant such as little bluestem as a soil indicator.

DISCUSSION OF FIELD WORK

In the course of field mapping for the soil survey of Mellette County, South Dakota, field notes were taken at representative little bluestem sites during the summers of 1957 and 1958. These notes included a short description of the kind of soil, dominant little bluestem plant associates, and density of little bluestem associations at each location.

This county is located in the south-central portion of South Dakota as shown in figure 1.

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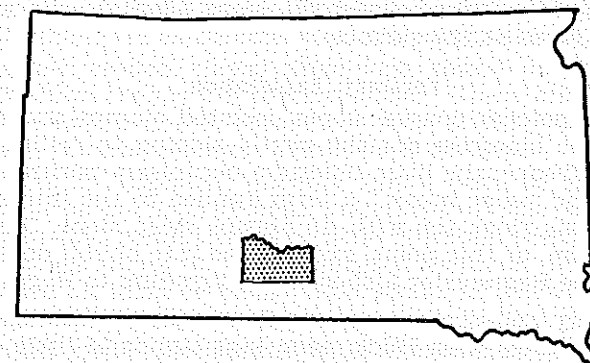


Figure 1. The Location of Mellette County in South Dakota

It is divided into three distinct physical divisions, namely, the rugged White River Badlands, the gently sloping to rolling Tertiary Tablelands, and the rolling Pierre Hills (8). Average annual precipitation varies from 16 to 18 inches and average annual temperature is about 49° F. Communities of little bluestem were observed on escarpment faces, colluvial-alluvial pediment slopes, and alluvial basins in the badlands proper; along steep slopes, drainageways, "slope-escarpments," abandoned roads, and animal-disturbed sites in the Tertiary Tablelands; and on steep slopes, narrow ridge tops, and remnants of gravelly terraces in the Pierre Hills region.

White River Badlands

Isolated clumps and sparse open-mat stands of little bluestem inhabit escarpment faces with slopes as steep as 50 percent. Soils of these escarpments are Lithosols, Regosols, or Lithosols intergrading to Regosols which have developed in materials ranging in texture from silt loams to clays. The profiles of these soils consist of a light-colored, thin (0-2"), generally calcareous A horizon overlying C or D horizons.

Thick, open-mat stands of little bluestem are frequently observed on the lower portions of concave colluvial-alluvial slopes. On these slopes, alluvial soils intergrading to minimal zonals have developed in silt loam or silty clay loam colluvial-alluvial sediments. They are calcareous at or within a few inches of the surface.

Nearly level alluvial basins, adjacent to, but below, dissected pediment slopes and escarpment walls, support, on an areal basis, a higher percentage of little bluestem than any other position in the Badlands proper. Thick, almost closed-mat stands of this grass

are established on light-colored silt loam alluvial soils which are usually calcareous at the surface.

Tertiary Tablelands

On 10-15 percent convex slopes, isolated clumps and open-mat stands of little bluestem dot the gently sloping to rolling Tertiary Tablelands. Frequently, little bluestem occupies a position immediately below the "slope break," a term applied to the intersection of a gently sloping ridge top with an abrupt steep slope. The rate of geologic erosion, at this point, exceeds the rate of soil development, hence soils are Regosols or Lithosols intergrading to Regosols.

Moderately well-drained zonal soils of upland drainageways are intermittently lined with thick, open-mat stands of little bluestem. These soils, derived from colluvial-alluvial sediments and/or Tertiary siltstone, have dark-colored silt loam A horizons overlying weak to moderately developed silty clay loam B horizons. Drainageways, with the exception of an occasional small depression, are the most humid sites in the uplands.

A "slope-escarpment," as the term is used here, refers to the position where a slope is interrupted by a micro-escarpment one to three feet high. In close proximity to the "slope-escarpment base," open-mat stands of little bluestem conspicuously parallel these micro-escarpments. Communities of this grass occupy soils which are classified as Regosols or Lithosols intergrading to Regosols. They are usually calcareous at the surface and differ little from soils of steep slopes.

Succession of grasses in abandoned roads has been discussed by Shantz (9). Soils of abandoned trail ruts are either Regosols or Regosols intergrading to minimal zonals and have developed in light-colored, moderately calcareous Tertiary siltstone or aeolian silts. Not infrequently, thick, open-mat stands of little bluestem line these ruts, but the surrounding area is noticeably void of little bluestem communities except for a few isolated plants.

Little bluestem also inhabits soils which have been disturbed by burrowing animals. Clumps of this grass occupy minimal zonal soils which are interspersed between predominant zonal associates. The former are disturbed soils leached to variable depths depending on placement and distribution of displaced parent material.

Pierre Hills

The most striking occurrence of little bluestem in the rolling Pierre Hills region is on steep, clayey slopes which display faint to pronounced terracettes or "catsteps." Slumping of shales on slopes ranging from 15-35 percent gives rise to this micro-relief. Sparse, open-mat stands of little bluestem occupy soils which are Regosols

intergrading to minimal zonals, Regosols, or Lithosols intergrading to Regosols which are calcareous with few exceptions at the surface.

On narrow, eroded, clayey ridge-tops, sparse open-mat stands of little bluestem occupy 3-8 percent slopes. These soils differ little from those of steep slopes, except for their slightly darker surface horizons and thicker, stronger prismatic B horizons.

Remnants of dissected, gravelly sandy loam or gravelly loam terraces occur on portions of small interfluvies of this region. Sparse to thick open-mat communities of little bluestem occupy calcareous gravels on steep slopes of these dissected terraces. Stands tend to be established on loam or loamy sand strata in lieu of coarser-textured strata in these gravelly deposits.

Dominant grass associates of little bluestem in xerophytic positions such as escarpment faces, steep slopes, "slope-escarpment," and ridge tops are the following: sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), needleandthread (*Stipa comata*), prairie sandreed (*Calamovilfa longifolia*), and western wheatgrass (*Agropyron smithii*). Western wheatgrass occurs as a minor associate on coarse and medium-textured soils but becomes the dominant associate on fine-textured soils.

In more mesophytic positions such as drainageways, colluvial-alluvial slopes, and alluvial basins, little bluestem associates are big bluestem (*Andropogon gerardi*), Canada wildrye (*Elymus canadensis*), stonyhills muhly (*Muhlenbergia cuspidata*), sideoats grama, prairie sandreed, western wheatgrass, and needleandthread.

SUMMARY

There is a general tendency for little bluestem to be established wherever geologic erosion or some other phenomena has disturbed the grass sod and exposed bare soil. Two exceptions to this are non-eroding drainageways and nearly level uplands. Aspect of slope does not seem to be the limiting factor in the distribution of this grass, although communities established on north-facing slopes tend to be more dense. This selectiveness is most pronounced in the Pierre Hills region where additional moisture obtained through melting of accumulated snowbanks provides a more favorable moisture regime for mid and tall grasses.

Apparently little bluestem is a better competitor for barren surfaces than other grass species. This differential competition may be influenced by factors such as seed germination, seedling establishment, efficiency of root system, and soil temperatures. Early

*Nomenclature follows Chase and Hitchcock (2) except common names which are according to Kelsey and Dayton (5).

flowering ecotypes of little bluestem have been reported in western Nebraska (6). Such early flowering may favor fall seedling establishment on arid positions. This grass is a decreaser under grazing, which may account for its absence except as isolated clumps in the nearly level uplands. In addition, seeds of little bluestem may be suspended in a dense short grass mulch and be unable to reach the soil, or if they do, the soil may be too dry for seed germination and seedling development.

A combination of interrelated factors such as type of root system, differential competition, aspect of slope, and ecotypic variants appear to explain the distribution of little bluestem in this area.

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