

PLEISTOCENE VOLCANIC ASH IN SOUTHEASTERN SOUTH DAKOTA ¹

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ABSTRACT

Volcanic ash or ashy silts have been collected from several localities in southeastern South Dakota, and are correlated with the Pearlette Ash Bed of Kansas. Criteria for identification are shard shape, color, presence of inclusions, and refractive index.

The Pearlette Ash Bed in Kansas lies in the Meade Formation, and is Late Kansan in age. In Nebraska the Pearlette Ash is a member of the Sappa Formation, also of Late Kansan age. Because its stratigraphic position is known, the ash is an important Late Kansan time marker to which other Pleistocene deposits may be related.

INTRODUCTION

Four localities of Pleistocene volcanic ash or ashy silt have been discovered in southeastern South Dakota. The ash has been identified with the Pearlette Ash Bed (Cragin, 1896) in Kansas on the basis of shard shape, color, refractive index, and the presence of inclusions. The exposures are (fig. 1):

1. Ashy silt, in the NW $\frac{1}{4}$ sec. 34, T. 106 N., R. 49 W., Moody County. Several inches of ashy silt, associated with sands and gravels (Grand Island Formation?) are exposed above till.
2. Ashy silt in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 23, T. 105 N., R. 49 W., Moody County. Six to eight inches of ashy silt is exposed below Wisconsin till.
3. Volcanic ash in the C NW $\frac{1}{4}$ sec. 11, T. 102 N., R. 51 W., Minnehaha County (Swineford, 1946). One to two feet of ash, associated with Sappa Formation silts, is exposed between two tills.
4. Volcanic ash in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, T. 92 N., R. 49 W., Union County (collected by M. J. Tipton, 1956). Up to 1 $\frac{1}{2}$ feet of ash is exposed below Wisconsin loess and above Newton Hills (?) sand, which in turn rests on Cretaceous rocks.

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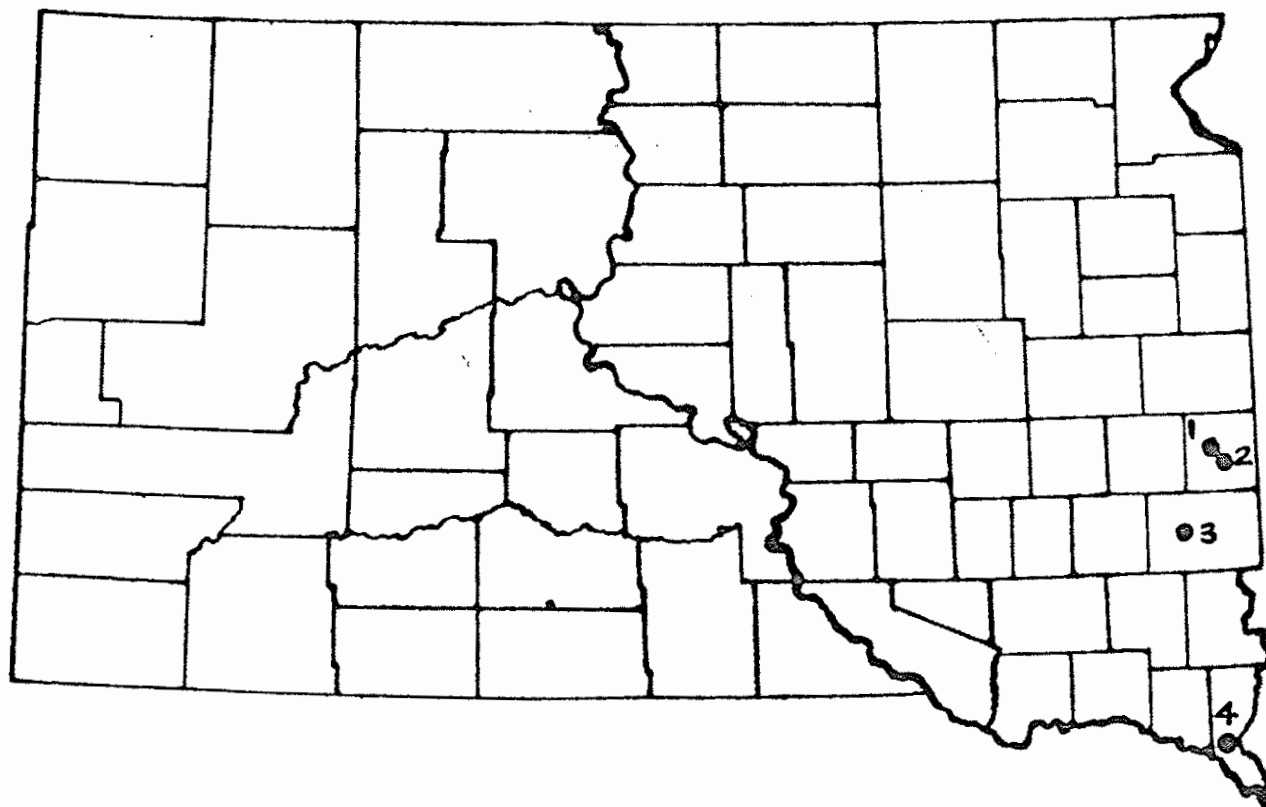


Figure 1. Index Map Showing the Location of Volcanic Ash Samples

DESCRIPTION

The physical properties of the ash samples were determined with the binocular and petrographic microscopes.

Described in This Paper.

Composition: Swineford (1946) showed the Pleistocene volcanic ash in Kansas to be composed of about 75% silica, 15% alumina, 3% ferric oxide, 2% lime, and 5% loss on ignition. The average percentage of ferric oxide (2.26%) is diagnostic for the Pleistocene ash, as contrasted with the average ferric oxide content (1.68%) of Pliocene ash deposits. No analyses, however, were performed on the ash samples in this paper.

Refractive Index: Refractive indices of the Pleistocene ash shards vary between 1.498 and 1.501. This corresponds with Swineford's determinations of 1.499 to 1.501, for Pleistocene ash in Kansas. The refractive indices of Pliocene ash shards vary between 1.500 and 1.502. Even though this is not a large difference, it is a significant one.

Color: Most of the ash shards are colorless, but some are pale yellow, pale red, pale green, and pale brown. Devitrified shards are translucent to opaque-white. The shards are mostly transparent except where alteration has made them translucent or opaque to transmitted light.

Shape: The shards are vesicular, fibrous, and platy (fig. 2). The outlines are normally angular except for preserved whole vesicles (fig. 2, c), which have rounded outlines.

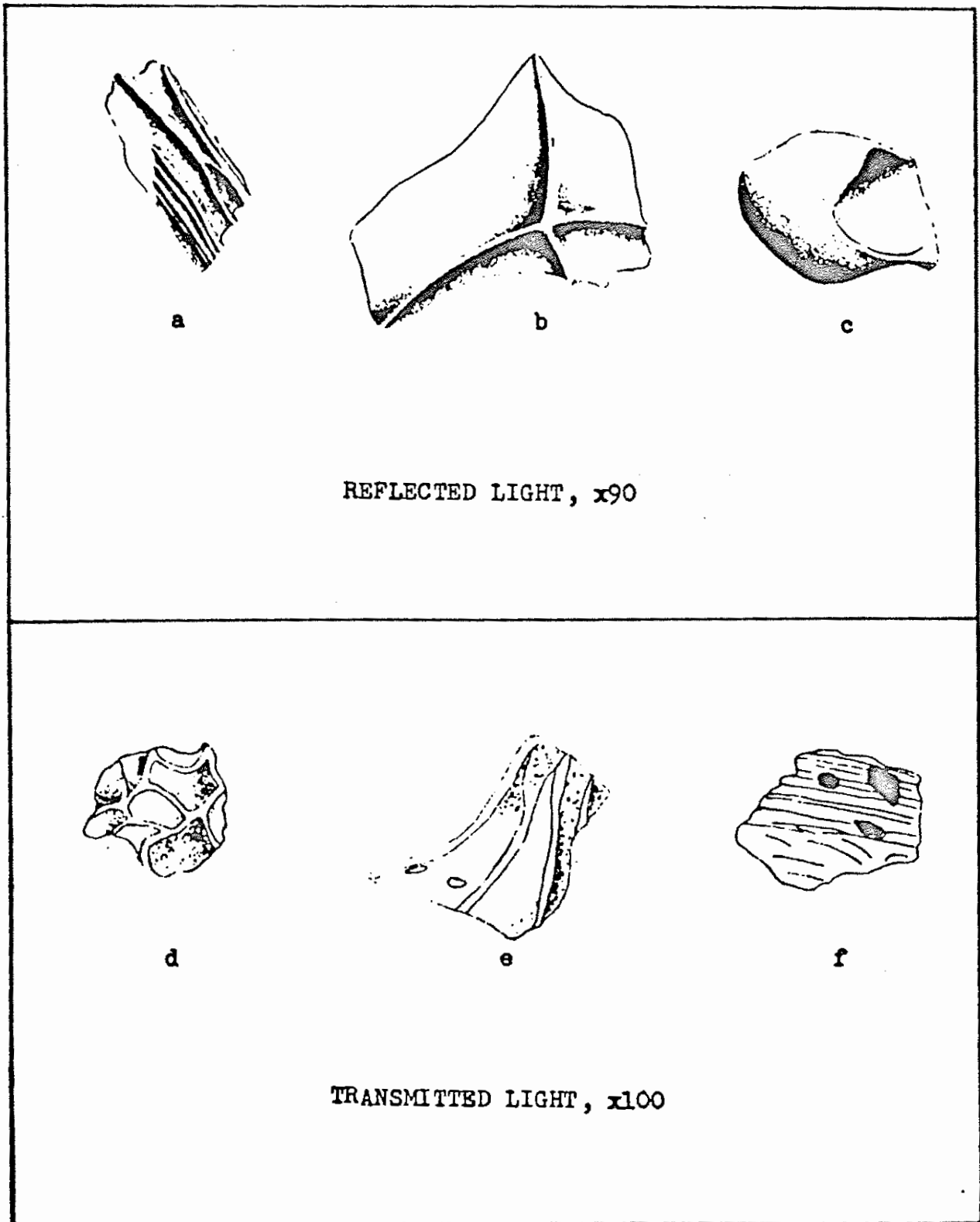


Figure 2. Shards from Pleistocene Volcanic Ash, Southeastern South Dakota.

Alteration: Shards from all four samples show alteration in the form of devitrification and sericitization (fig. 2 d, e); this is especially true for the shards from locality 4. The devitrified shards have etched and pitted surfaces. Sericitization seems to have taken place most strongly along the edges of the shards and along the intervesicular ridges. In Fig. 2 d and e this alteration can be seen as the stippled areas.

Inclusions: Minute inclusions (fig. 2 d, e, and f) are randomly spaced in some shards; they are transparent (possibly gas or fluid) and opaque (probably mineral inclusions).

CORRELATION AND GEOLOGIC SIGNIFICANCE

The volcanic ash samples here described are identified with the Pleistocene Pearlette Ash Bed in Kansas, by comparison of physical properties.

The Pearlette Ash Bed in Kansas is found in both the Sappa and the Grand Island Members of the Meade Formation, and is Late Kansan in age. It is, therefore, an important time marker to which other Pleistocene deposits may be related, for it is the only significant ash fall in the Pleistocene Epoch. The description of the ash given here may be useful in the future identification of the Pearlette Ash, thus elucidating some of the complexities of South Dakota's Pleistocene geologic history.

REFERENCES CITED

- Cragin, F. W. 1896, Preliminary notice of three late Neocene terranes of Kansas: Colorado College Studies, vol. 6, p. 53-54.
- Swineford, Ada, and Frye, J. C., 1946, Petrographic Comparison of Pliocene and Pleistocene Volcanic Ash from Western Kansas: Kansas Geol. Surv. Bull. 64, p. 3-32.