

# HUTTON-PINKHAM SITE GEOLOGY

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## TOPOGRAPHIC SETTING

The Hutton-Pinkham site is exposed in a north-south trending, steep ( $40^{\circ}$ - $60^{\circ}$ ), west-facing stream meander cut bank that is approximately 4.5 m high. The meander scarp resulted from lateral cutting by the ephemeral stream channel of Bonny Creek, which lies at the foot of the scarp. A three-tiered Holocene terrace system is present to the east of the Bonny Creek channel.

The T2 surface is very limited in extent; much of it was removed by lateral cutting of the stream channel prior to the deposition of the sediment that underlies the T1 terrace (Fig. 1). The T3 terrace is underlain by eolian sand and forms the generally flat surface that lies east of the site.

## SEDIMENTARY SEQUENCE

Three main sedimentary units are exposed in the meander cut scarp at the site (Fig. 2). In descending order, they are:

1) Eolian Sheet Sand Unit — Varies from 1.9 to 3 m in thickness. The sands are massive, well-sorted and medium- to coarse-grained. The surface

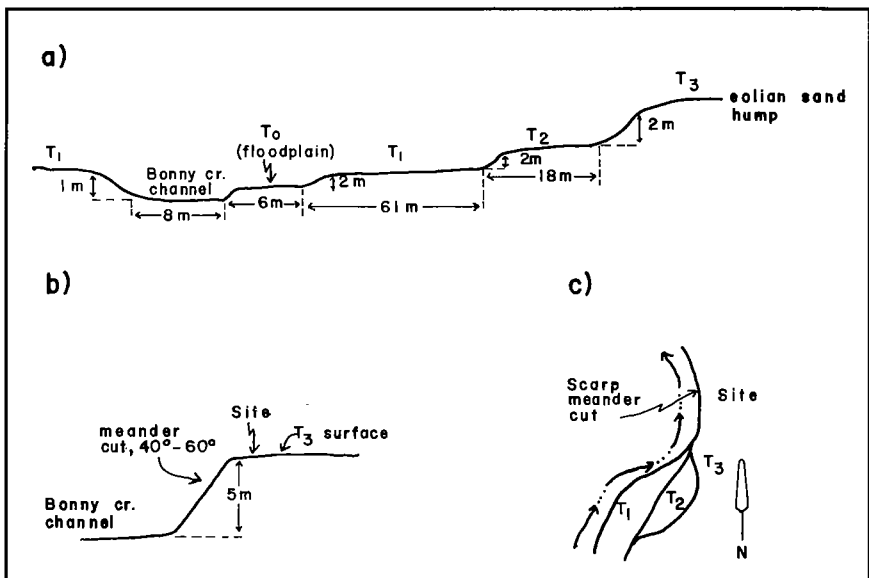


FIGURE 1. Geologic maps of the Hutton-Pinkham site and vicinity. a: Geological cross-section sketch of Bonny Creek drainage illustrating the three-tiered Holocene terrace system present to the east of the Bonny Creek channel; b: Vertical cross-section sketch illustrating meander cut located at the Hutton-Pinkham site; c: Horizontal sketch map of the three-tiered terraced system at the Hutton-Pinkham site and vicinity.

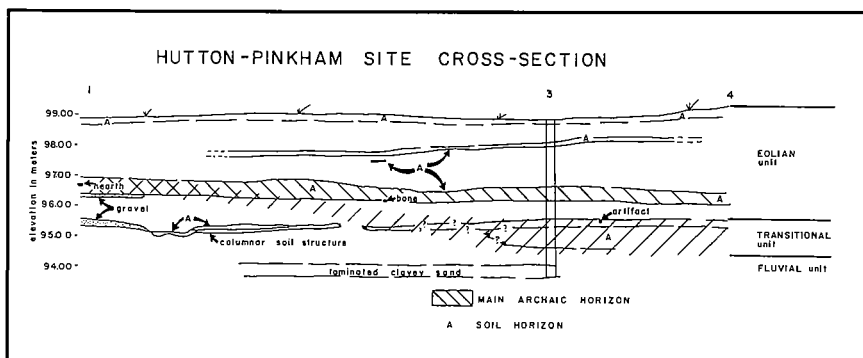
soil (A horizon) and three gray, horizontal, buried pedogenic A horizons (paleosols) are present within this unit. The most prominent soil is the basal paleosol (approximately 1.3-m-thick A horizon), which lies at the bottom of the eolian sequence and contains the main Archaic cultural horizon at the site.

The paleosols represent periods of geomorphic stability when the sheet sands stabilized and eolian activity ceased, such as the present time. The coarseness of the sand grains indicate that past wind velocity was as strong or stronger than today's wind velocity.

2) Transition Unit — Zone between eolian sand above and fluvial stream sediments below. This unit consists mainly of sand grains similar to those in the eolian sand above, plus intermixed pebbles of varying amounts (1-10%). The sand is massive and poorly sorted. A prominent thick light gray Abk horizon (approximately 66 cm thick) is developed in this unit, in the southern half of the site. Paleoindian artifacts were recovered from the top of the transition unit in the southern portion of the site.

The transition unit varies from 52 to 167 cm in thickness and rises in the stratigraphic section from south to north. This unit probably formed as a result of lateral cutting of the stream channel and concurrent encroachment of eolian sand deposits. Some colluvial sedimentation may also have occurred; the details have to be worked out. The transgressive nature of the deposition (higher in the north and lower in the south) suggests that eolian sand deposition may have begun at an earlier time in the southern portion of the site. This lateral facies change is probably just a local situation and probably does not have any regional significance in regard to the inauguration of eolian activity.

3) Fluvial Unit (Late Pleistocene) — This is the basal unit exposed at the site. It is approximately 150 cm thick. It is composed of near horizontal lenses (10-100 cm thick) of alternating gravels, coarse sand, massive fine- to medium-grained sand, laminated fine-grained clayey sand and cross-bedded sand lenses.



**FIGURE 2. Stratigraphic cross-section of the Hutton-Pinkham site, Colorado. The laminated clayey sand occurs at and below the modern floodplain and contains the Pleistocene megafauna mentioned in the text. Artifact located on the right side of lower A horizon in the Transitional unit is illustrated in Figure 8, center. Numbers 1 and 4 refer to the location of profile in Larson et al., Figure 4, this volume. 3 shows location of Figure 13 shown in Larson, et al., this volume.**

These sediments were probably deposited under low- to moderate-flow regimes, under ephemeral stream conditions, although Bonny Creek probably contained water for a longer period of the year than it does today. The lack of significant iron staining (soil gleying) indicates that the sediments were not waterlogged (saturated) for extended periods of time. The water table was not at the surface during much of the late Pleistocene time. Typically, late Pleistocene fluvial sediments are heavily iron-stained (gleyed), e.g., at Agate Basin site (Frison and Stanford 1982).

#### **SUMMARY**

During the late Pleistocene, all sediments deposited at the site were of fluvial origin. Sometime during early Holocene time (perhaps 9,000 to 10,000 years BP) eolian sheet sand deposition commenced. Alternating episodes of fluvial and eolian deposition and possibly some colluviation continued through  $4310 \pm 200$  B.P. (Beta-35336). Only eolian deposition has occurred at the site since that time. Eolian sedimentation was punctuated by periods of stability when the prominent soil horizons formed. These A horizons probably formed under a grassland environment. The modern period is one of stability and soil formation in the site area. Two and possibly three soils formed during periods of stability that occurred within the Transition Unit. At least one period of surface stability occurred during the time period when the fluvial sediments were deposited, as witnessed by the presence of a local A horizon that developed in a swale present in the northern part of the site (see Fig. 2). The soil formed when the floodplain stabilized in position for a period of time.

#### **REFERENCES CITED**

- Frison, George C. and Dennis J. Stanford (editors)  
1982 *The Agate Basin Site: A Record of Paleoindian Occupation of the Northwestern Plains*. Academic Press, New York.