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ARCHAEOLOGY AND GEOMORPHOLOGY OF THE CLOVIS-AGE KLEIN SITE NEAR KERSEY, COLORADO

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ABSTRACT

The Klein site Clovis locality consists of lithic artifacts and mammoth and horse bone that have eroded from a small, low-relief gravel ridge disturbed by agricultural practices. The ridge is on the late Pleistocene Kersey terrace of the South Platte River and is part of a ridge-swale landscape produced by the river as it flowed in a braided pattern across an aggrading floodplain. Two soil types, Ustoll and Aquoll, have formed in the fine-grained sediments that mantle the ridges and swales, respectively. Investigations at the Klein site and others on the Kersey terrace suggest that Paleoindian materials may be found in association with either soil.

Keywords: geoarchaeology, Paleoindian, Clovis, mammoth, floodplain.

SITE DESCRIPTION

The Klein site (5WL1368) is located south of U.S. Highway 34 approximately 1.8 km west of the town of Kersey (NE 1/4, Section 19, T5N, R64W) in Weld County, Colorado (Fig. 1). It is situated on the Kersey terrace (Bryan and Ray 1940), a fill terrace formed by a braided network of the South Platte River during latest Pinedale time (McFaul et al. 1991; Holliday 1987; Swan 1975). The Kersey terrace flanks the modern South Platte River from the Rocky Mountain Front Range near Denver, downstream to Fort Morgan, and possibly beyond (Smith et al. 1964; Holliday 1987). This surface can also be traced for some distance up the Cache la Poudre River (Bryan and Ray 1940).

The terrace tread averages some 11 m above the modern South Platte floodplain and has a downstream gradient of 1.9 m/km. In the vicinity of the Klein site, the Kersey terrace is nearly 3 km wide.

The surface of the Kersey terrace is relatively flat. However, it bears faint reflections of ridge/swale topography (McFaul et al. 1991; Holliday 1987). The general flatness has resulted from overbank alluviation, eolian deposition, and most extensively from farming practices during the past century. Farmers have leveled approximately 85% of the terrace to facilitate irrigation.

The late Pleistocene/early Holocene gravel bars within the terrace are now manifested as broad, low ridges which generally trend southwest/northeast. These are recognizable on aerial photographs by their lighter coloration and distinctive sinuous form (Holliday 1987:321-324;

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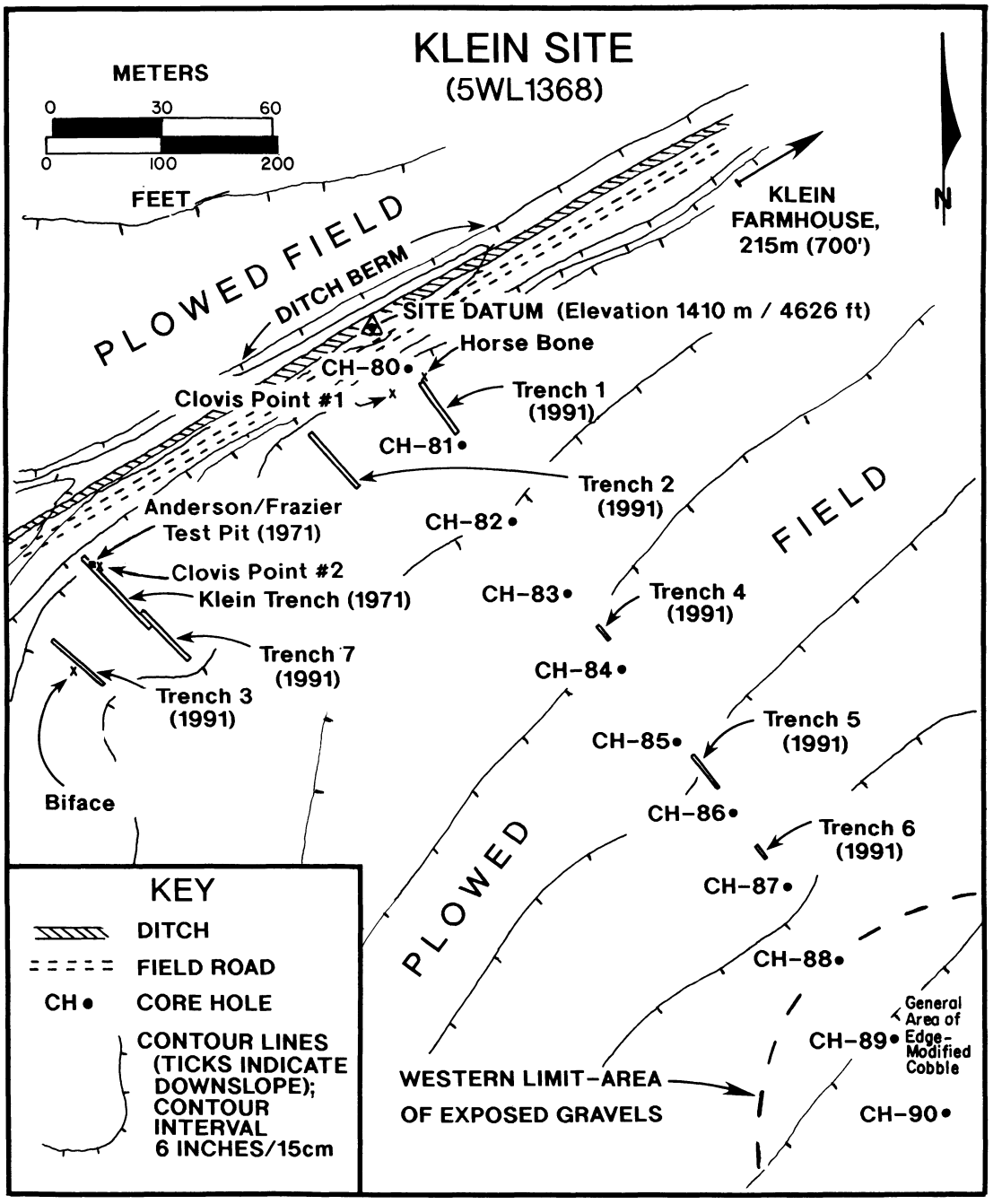

Figure 1. Map of the Klein site showing local topography and locations of cultural materials, core holes, and trenches.

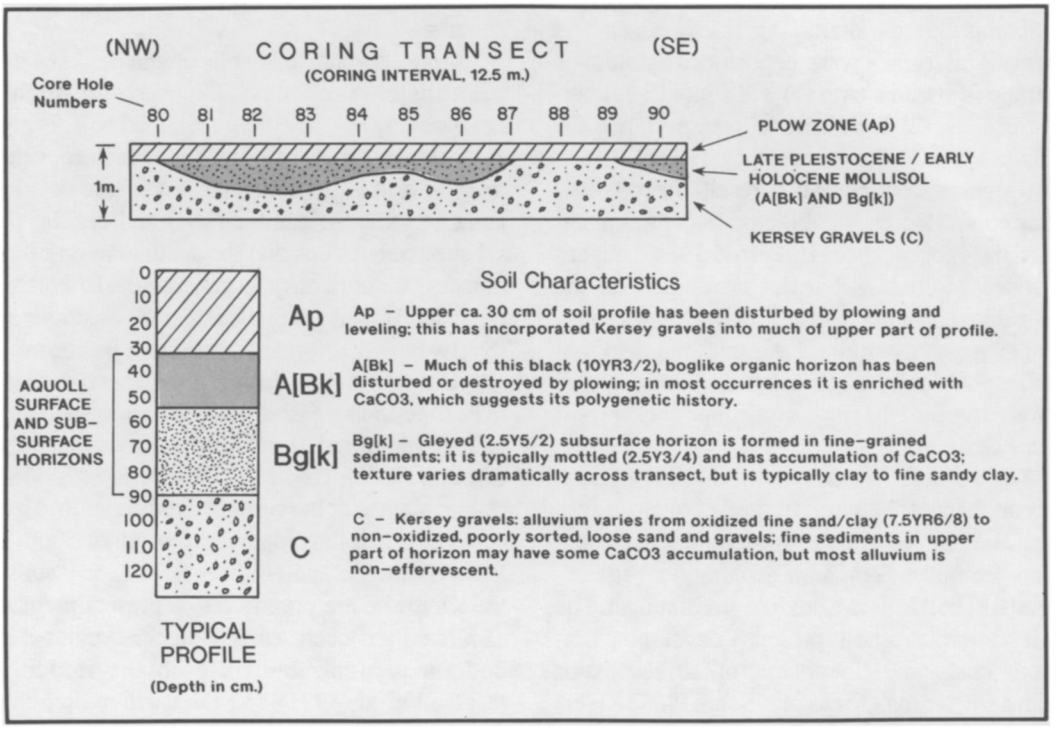

Figure 2. Klein site coring transect (direction of view, NE) and sample soil profile.

Jepson et al. 1993).

The Klein site is associated with one such gravel ridge, approximately 2.4 km from the edge of the Kersey terrace. The ridge is 0.5-1.5 m higher than the adjacent fields and an irrigation ditch follows its crest (Figs. 1, 2). Artifacts, including two Clovis projectile points found by the landowner, Louis L. Klein, as well as mammoth and horse bones, have been recovered from a 3.75 ha rectangle on the southeastern flank of the gravel ridge. The site surface is completely disturbed due to land leveling, irrigation ditch construction/maintenance, and annual cultivation. It is impossible to ascertain the relationship, if any, between the Clovis points and the bones.

The consistent association of irrigation ditches with gravel ridges across the terrace implies that this relationship may be useful in defining other potential Clovis locales on the Kersey terrace. However, recent testing of similar areas near the Klein site during the rebuilding of approximately 16 km of U.S. Highway 34 did not lead to additional discoveries of Paleoindian sites (Jepson et al. 1993; Zier et al. n.d.).

In this paper, we briefly summarize our geoarchaeological evaluation of the Klein site and the artifacts that have been recovered. Our initial geoarchaeological investigations at the Klein site, in November 1990, consisted of sampling and description of a series of 11 cores spaced 12.5 m apart along a transect perpendicular to the trend of the gravel ridge. In February of 1991, Mr. Klein arranged the excavation of seven exploratory backhoe trenches along the southern flank of the gravel ridge (Fig. 1). Four were placed along the coring transect to augment core descriptions and to test those areas deemed to have higher geoarchaeologic potential. The remaining three trenches were excavated in areas where cultural materials had been found. A surface reconnaissance was conducted as well.

SOIL/SEDIMENT DESCRIPTION

The cross-sectional soil/sediment profile (Fig. 2) depicts the paleotopography of the Kersey terrace across the Klein site. The transect shows a

main gravel ridge flanked by undulating topography comprised of alternating micro-ridges and swales. This ridge-swale depositional pattern is common in streams with (1) wide, rapidly migrating channels, (2) high bedload transport, and (3) easily erodible banks (Fahnestock 1963).

Ridge-swale topography results in soil variations controlled by topography, known as a soil catena or toposequence (Birkeland 1984). In general, two Mollisol suborders developed on the fine-grained sediments mantling the Kersey gravels: (1) a poorly-drained Aquoll in low topographic positions, and (2) a better-drained Ustoll on higher parts of the ridge-swale topography (Soil Survey Staff 1975).

The Aquolls in the poorly-drained depressions or channels between the gravel micro-ridges (Fig. 2) received much fine-grained sediment which promoted formation of cumulic, organic-rich A[Bk] horizons in a boglike environment. The soil is similar to Aquolls presently developing "on bottom lands and floodplains of all the major streams [including the modern South Platte River] in the area" (Crabb 1980:8).

The Aquolls characteristically have a gleyed subsurface horizon (Bg[k]) developed in fine-grained sediment immediately above the Kersey gravels. Gleyed horizons indicate a high water table (i.e., wetlands) which creates an oxygen-deficient, reducing (waterlogged) environment. At the Klein site, these subsurface horizons are gray to bluish-gray and contain prominent iron and manganese mottles (Fig. 2). The surface (A[Bk]) horizons of these soils, although discontinuous, are cumulic as a result of development in low-lying, poorly-drained landscape positions.

The presence of Aquolls implies that paleoenvironmental conditions on the Kersey terrace during the late Pleistocene/early Holocene were cool and moist. Reider (1990) documented similar soil morphologies at numerous late Pleistocene/early Holocene sites (e.g., Agate Basin, Carter-Kerr-McGee, and Sheaman sites) throughout the plains and mountain regions of Colorado and Wyoming. Because the poorly-drained conditions that led to Aquoll formation do not presently exist on the Kersey terrace, they are considered "relict" soils (Birkeland 1984) indicative of a paleoenvironment whose signature has not yet been erased by subsequent (post-terrace abandonment) pedogenesis.

Aquolls grade to Ustolls up the flanks of both the main gravel ridge and the micro-ridges/channel bars (Fig. 2). The better-drained soil-forming environment on the ridges resulted in the development of a mollisol characterized by the development of oxidized cambic (Bw) and argillic (Bt) subsurface horizons and the accumulation of carbonates (Bk horizons). In general, the Bt horizons typically formed along the midslope positions and the Bw horizons formed at the crest positions.

Both the Aquoll and the Ustoll are considered to be time-transgressive. In other words, due to the lack of additional deposition, the soils that began forming during the late Pleistocene/early Holocene remained at the surface throughout the Holocene (i.e., their development transgresses both the late Pleistocene and Holocene). As such, soils at the Klein site are proposed to represent members of a late Pleistocene/early Holocene regional pedoderm recognizable on both the floodplain (McFaul et al. 1991) and the surrounding dunal localities (Forman and Maat 1990; Forman et al. 1992).

Geoarchaeologic implications are that:

(1) cultural materials within the surface horizons of the time-transgressive soil are likely to have been disturbed to a depth of ≥30 cm by historic agricultural practices and therefore lack integrity;

(2) even where the time-transgressive soil has not been disturbed by agricultural activity, cultural components will be compressed and may range in age from Paleoindian to historic; and

(3) where the late Pleistocene/early Holocene soil is undisturbed due to burial by more recent sediment, these deposits have the potential to yield nonintrusive, in situ cultural materials.

DESCRIPTION OF ARTIFACTS AND FAUNAL REMAINS

Artifacts

Four tools from the site, including two Clovis-type projectile points, a biface fragment, and a modified cobble, are described briefly (see Table 1 for metric data). The only other artifact recovered to date is a small flesh-colored chalcedony interior flake.

Both projectile points (Fig. 3A,B) are of red-

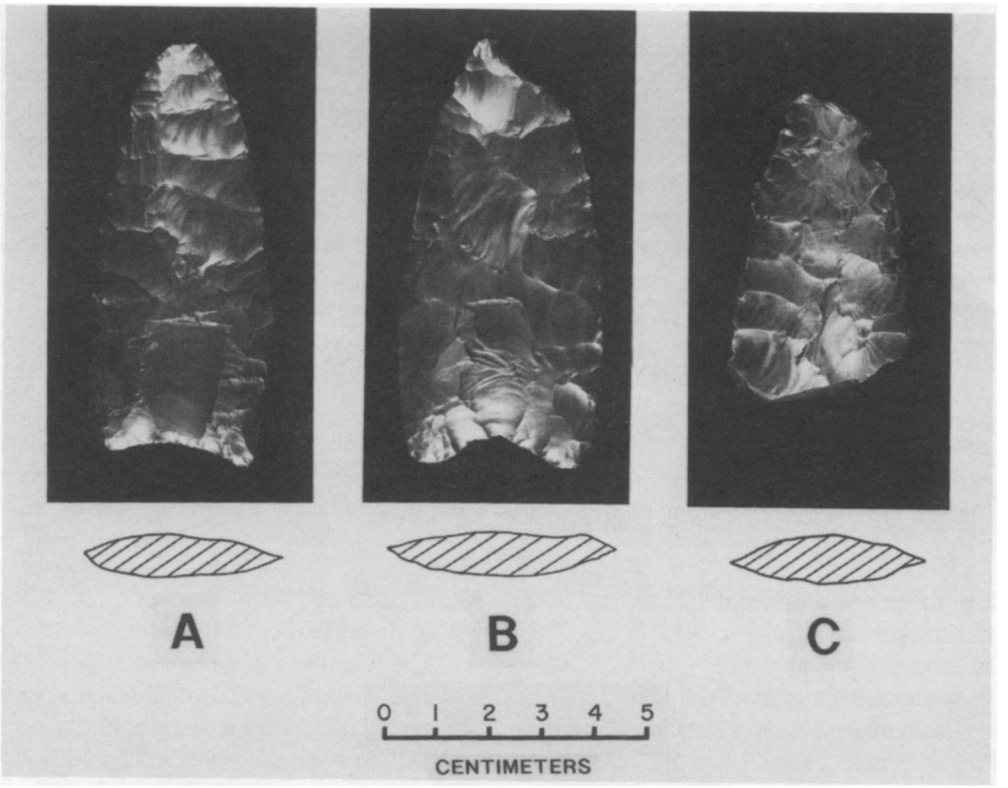

Figure 3. Projectile points and biface from the Klein site. A-Clovis point no. 1; B-Clovis point no. 2; C-biface.

dish chert and exhibit waxy luster consistent with heat treatment. Materials are similar but not identical; source(s) is unknown. Both are lanceolate in form with convex blade edges and concave bases. Bases and proximal edges are heavily ground, and channel flakes extend distally 2.3-2.7 cm from the bases. Cross sections are lenticular. A large notch in one edge near the distal end of projectile point 2 is probably intentional modification and results in an offset tip. Similar tip notching has been noted on a Clovis point from the Dent site (Wormington 1957:Fig. 12) and an isolated Clovis point from Canyonlands National Park in Utah (A.B. Anderson, personal communication to C.J. Zier, 1992).

The biface (Fig. 3C) could be a third Clovis point although the base and lower blade edges are absent and the blade is truncated by a proximal hinge fracture. It is of banded yellow brown to pinkish red chert or petrified wood, also of unknown origin, and lacks the waxy luster characterizing the two projectile points. The overall level of craftsmanship exhibited in the biface is some-

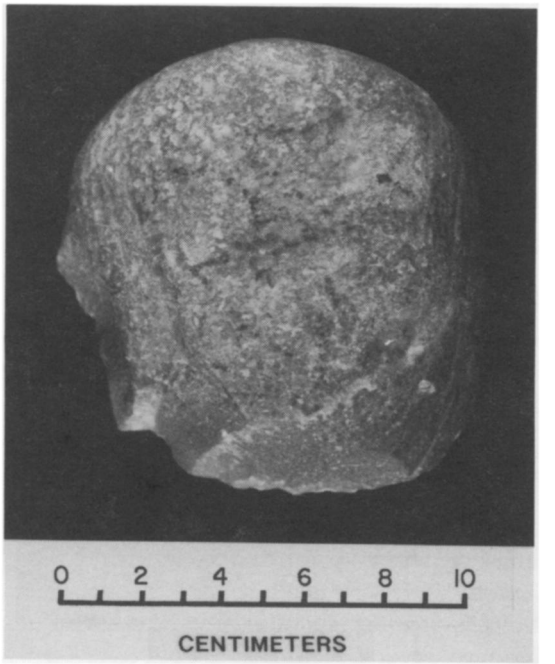

Figure 4. Modified cobble.

Table 1. Descriptive Data: Lithic Tools from the Klein Site.

Artifact	Metric Data (cm) Length	Width	Thickness	Weight (g)	Material and Color	Figure Reference
Projectile Point #1	7.7	3.4	0.9	23.7	reddish pink chert	3-A
Projectile Point #2	8.0	3.9	0.8	29.7	dark reddish brown chert	3-B
Biface	5.7[1]	3.5	1.0	N/A	yellow/brown to red/pink petrified wood or chert	3-C
Modified Cobble	11.3	10.9	4.1	N/A	brown quartzite	4

[1]incomplete
N/A = not available or not recorded for fragmentary artifact

what lower than in the projectile points. Its cross section is thick and lenticular.

The modified stream cobble (Fig. 4), of medium brown quartzite, is ovate in plan and flattened. Bifacial retouch is apparent along one edge and is manifested as a short series of overlapping scars.

Faunal Materials

Identifiable faunal remains consist of a nearly complete mammoth (*Mammuthus* sp.) cuneiform and horse (*Equus* sp.) proximal metacarpal. The metacarpal is robust, within the size range of Pleistocene horses, and is dense and possibly partially mineralized. While occurring in general association with Clovis artifacts, there is no direct evidence that faunal materials at the site are present as a result of cultural behavior.

DISCUSSION AND SUMMARY

A widespread occurrence of isolated Clovis points in northeastern Colorado includes, in the immediate vicinity of the Klein site, several artifacts from the Kersey terrace gravels on both sides of the South Platte River (L.L. Klein and R.H. Brunswig, Jr., personal communication to D.A. Jepson, 1991). Mammoth remains in association with Clovis artifacts are also believed to have been removed, several decades ago, from Kersey terrace sediments at a locality near the South Platte River–Cache la Poudre River confluence (L.L. Klein, personal communication to D.A. Jepson, 1991). However, little information exists.

The Klein site is diffuse and disturbed, and has yielded only limited cultural remains. Its value lies mainly in the data it has provided about general and specific geomorphic settings. The subsurface soil-sediment relationships suggest that:

> (1) an affinity may exist between the main gravel bars and Clovis occupants;
>
> (2) the site witnessed a post-Clovis, soil-forming event characterized by the formation of Aquolls in depressions between the gravel micro-ridges and Ustolls on the flanks and crests of these micro-ridges; and
>
> (3) in locales where the A horizons of these soils have been buried, and thus preserved, these paleosols have the potential to yield in situ Paleoindian cultural materials.

Comparison of the Klein site with artifacts and fauna of Clovis sites elsewhere is not solid. Akin to most other western Clovis sites, the Klein site does not provide incontrovertible evidence of a man–mammoth relationship (see comments in Frison 1991:39). The association between artifacts and proboscidian remains at the site is unproven; due to recent disturbance of the site area, the original contexts of bones and artifacts are unknown. The Klein site does, however, resemble other Clovis sites such as Colby (Frison and Todd 1986; Frison 1976:728-730; 1991:149-155) in its

low density of artifacts and very high ratio of tools to debitage. This phenomenon may merely reflect the absence of intact occupational surfaces at most Clovis sites, the effects of reworking of archaeological materials by natural erosional processes, or the occurrence of projectile points in the bodies of mammoths that survived kill attempts and died at a later time, as may be the case with the Escapule site in Arizona (Hemmings and Haynes 1969).

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REFERENCES CITED

Birkeland, Peter W.
1984 *Soils and Geomorphology*. Oxford University Press, New York and Oxford.

Bryan, Kirk, and L.L. Ray
1940 Geologic Antiquity of the Lindenmeier Site in Colorado. *Smithsonian Miscellaneous Collections* 99(2).

Crabb, James A.
1980 *Soil Survey of Weld County, Colorado, Southern Part*. Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C.

Fahnestock, R.K.
1963 Morphology and Hydrology of a Glacial Stream—White River, Mount Rainier, Washington. *United States Geological Survey Professional Paper 422-A*, United States Government Printing Office, Washington, D.C.

Forman, Steven L., Alexander F.H. Goetz, and Roberta H. Yuhas
1992 Large-Scale Stabilized Dunes on the High Plains of Colorado: Understanding the Landscape Response to Holocene Climates with the Aid of Images from Space. *Geology* 20:145-148.

Forman, Steven L., and Paula Maat
1990 Stratigraphic Evidence for Late Quaternary Dune Activity near Hudson on the Piedmont of Northern Colorado. *Geology* 18:745-748.

Frison, George C.
1976 Cultural Activity Associated with Prehistoric Mammoth Butchering and Processing. *Science* 194(4266):728-730.

1991 *Prehistoric Hunters of the High Plains* (2nd ed.). Academic Press, San Diego.

Frison, George C., and Lawrence C. Todd
1986 *The Colby Mammoth Site: Taphonomy and Archaeology of a Clovis Kill in Northern Wyoming*. University of New Mexico Press, Albuquerque.

Hemmings, E.T., and C. Vance Haynes
1969 The Escapule Mammoth and Associated Projectile Points, San Pedro Valley, Arizona. *Journal of the Arizona Academy of Science* 5(3):84-88.

Holliday, Vance T.
1987 Geoarchaeology and Late Quaternary Geomorphology of the Middle South Platte River, Northeastern Colorado. *Geoarchaeology* 2:317-329.

Jepson, Daniel A., Christian J. Zier, Michael McFaul, Karen Lynn Traugh, and William R. Doering
1993 Draft: Archaeological and Geomorphic Investigations along U.S. Highway 34 between Greeley and Kersey, Weld County, Colorado. Prepared for Colorado Department of Transportation by Centennial Archaeology, Inc., Fort Collins, Colorado, and LaRamie Soils Service, Laramie, Wyoming.

McFaul, Michael, William R. Doering, and Christian J. Zier
1991 Late Pleistocene–Early Holocene Soil–Sediment Relationships on the Kersey Terrace, Northeastern Colorado. *Current Research in the Pleistocene 8:117-119.*

Reider, Richard G.
1990 Late Pleistocene and Holocene Pedogenic and Environmental Trends at Archaeologic Sites in Plains and Mountain Areas of Colorado and Wyoming. In: *Archaeological Geology of North America: Geological Society of America, Centennial Special, Volume 4*, edited by N.P. Lasca and J. Donahue, pp.335-360. Geological Society of America, Boulder.

Smith, R.O., P.A. Schneider, and L.R. Petri
1964 Ground-Water Resources of the South Platte River Basin in Western Adams and Southwestern Weld Counties, Colorado. *United States Geological Survey-Water Supply Paper 1658*, United States Government Printing Office, Washington, D.C.

Soil Survey Staff
1975 Soil Taxonomy. *Agricultural Handbook* No. 436. Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C.

Swan, Frank Herbert, III
1975 *Pleistocene and Holocene Deposits of the Lower Cache La Poudre River Basin, Colorado.* Ph.D. dissertation, The Johns Hopkins University. University Microfilms, Ann Arbor.

Wormington, H. Marie
1957 Ancient Man in North America. *Denver Museum of Natural History Popular Series* No. 4. Denver.

Zier, Christian J., Michael McFaul, Daniel A. Jepson, and Karen Lynn Traugh
n.d. Draft: Archaeological and Geomorphic Investigations along U.S. Highway 34 between Kersey and Hardin, Weld County, Colorado (tentative title). Prepared for Colorado Department of Transportation by Centennial Archaeology, Inc., Fort Collins, Colorado, and LaRamie Soils Service, Laramie, Wyoming.