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GETTING AWAY FROM IT ALL: A STUDY OF MAN, MOUNTAINS, AND THE TWO-DROUGHT ALTITHERMAL

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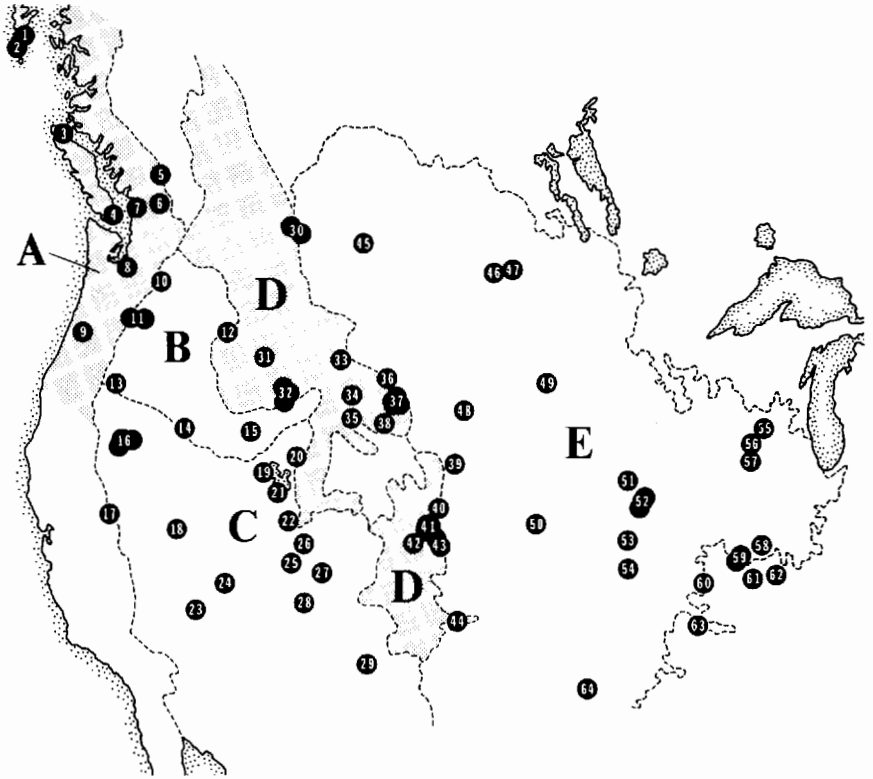
ABSTRACT

Analysis of 171 charcoal and bone-collagen dates from Altithermal (7500-5000 BP) archeological components in western North America suggests that human population fluctuations during this interval were strongly influenced by regional changes in effective moisture. Man's alternating preference for moist and dry environments indicates that the Altithermal "Long Drought" was in reality two severe short droughts (*ca.* 7000-6500 BP and 6000-5500 BP), separated by an episode of increased effective moisture, probably involving late winter and spring precipitation. The drought of 6000-5500 BP affected the largest geographic area, discouraging human occupation of the Colorado and Columbia Plateaus, Great Basin, Great Plains, and Prairie Peninsula, and causing an influx of people into moist refuge areas such as the Southern, Central, and Northern Rocky Mountains and Pacific Northwest.

The Indian Peaks region of the Front Range, north-central Colorado, was an important Altithermal refuge area; at least three cultural complexes were present at timberline in the Indian Peaks between 6000 and 5500 BP. Projectile point styles associated with two of the complexes (Albion Boardinghouse and Fourth of July Valley) are believed to be ancestral to styles used subsequently on the Northwestern Plains (i.e., Mallory, McKean Lanceolate, and Duncan points); their spread from mountain refugia onto the plains is seen as a response to the beginning of Neoglaciation. Projectile points of a third cultural complex (Mount Albion) have no known local antecedents; their appearance in the Front Range during the drought of 6000-5500 BP was paralleled by the appearance of similar projectile point styles at arctic tree limit in Alaska and Keewatin, and in the humid forests of the northeastern United States.



1 Lawn Point, B.C.
2 Kasta, B.C.
3 Fort Rupert, B.C.
4 Helen Point, B.C.
5 Lehman, B.C.
" Nesikep Creek, B.C.
6 Milliken, B.C.
" Esilao Village, B.C.
7 Glenrose Cannery, B.C.
8 Jokumsen, Wash.
9 Luckiamute Hearth, Ore.
10 Ryegrass Coulee, Wash.
11 Fivemile Rapids, Ore.
" Hobo Cave, Ore.
12 Weis Rockshelter, Ida.
13 Connley Caves, Ore.
14 Dirty Shame Rockshelter, Ore.
15 Wilson Butte Cave, Ida.
16 King's Dog, Cal.
" Menlo Baths, Cal.
" Silent Snake Spring, Nev.
17 Spooner Lake, Nev.
18 Triple T Shelter, Nev.
19 Hogup Cave, Utah
20 Weston Canyon Rockshelter, Ida.
21 Sandwich Shelter, Utah
22 Spotten Cave, Utah
23 Corn Creek Dunes, Nev.
24 O'Malley Shelter, Nev.
25 Sudden Shelter, Utah
26 Joe's Valley Alcove, Utah
27 Cowboy Cave, Utah
28 Dust Devil Cave, Utah
29 Grants Arroyo, N.M.
30 Head-Smashed-In, Alta.
" Gap, Alta.
31 Shoup Rockshelters, Ida.
32 Veratic Rockshelter, Ida.
" Bighorn Shelter, Ida.
" Jackknife Cave, Ida.
33 Myers-Hindman, Mont.
34 Mummy Cave, Wyo.
35 Helen Lookingbill, Wyo.
36 Sorenson, Mont.
37 Laddie Creek, Wya.
" Granite Creek Rockshelter, Wya.
" Southsider Cave, Wyo.
" Rice Cave, Wyo.
" Spanish Point Quarry, Wya.
38 Wedding of the Waters Cave, Wyo.
39 Heli Gap, Wyo.
40 Lightning Hill, Colo.
41 Hungry Whistler, Colo.
" 5 BL70, Colo.
" Fourth of July Valley, Colo.
" Albion Boardinghouse, Colo.
41 Ptarmigan, Colo.
42 Vail Pass, Colo.
43 Cherry Gulch, Colo.
" Helmer Ranch, Colo.
44 Dry Cimarron River, N.M.
45 East Battle Creek, Alta.
46 Long Creek, Sask.
47 Oxbow Dam, Sask.
48 Hawken, Wyo.
49 Walth Bay, S.D.
50 Spring Creek, Neb.
51 Logan Creek, Neb.
52 Walker Gilmore, Neb.
" Hill, Iowa
" Lungren, Iowa
53 Coffey, Kans.
54 William Young, Kans.
55 Raddatz Rockshelter, Wis.
56 Brogley Rockshelter, Wis.
57 Robert Battey Rockshelter, Iowa
58 Koster, Ill.
59 Arnold-Research Cave, Mo.
" Graham Cave, Mo.
60 Rodgers Shelter, Mo.
61 Pat Shelter, Mo.
62 Modoc Rockshelter, Ill.
63 Jakie Shelter, Mo.
64 Gore Pit, Okla.

FIGURE 1. Archeological sites with Altithermal (7500-5000 BP) charcoal or bone collagen dates. A, Pacific Northwest; B, Columbia Plateau; C, Great Basin and Colorado Plateau; D, Rocky Mountains; E, Great Plains and Prairie Peninsula. For dates and references, see Benedict and Olson (1978).

The Altithermal was a time of rapid and complex climatic change, leading to human population dislocations on a continental scale.

INTRODUCTION

The Altithermal "Long Drought" was viewed by Antevs (1955) as a time during the mid Holocene when the western United States was warmer and drier than at present. Despite some contradictory evidence (Aschmann 1958; Martin 1963), present data generally support the Antevs model, pointing to a postglacial aridity maximum between about 7500 and 5000 BP. No climatic interval has generated more controversy among archeologists working in the Great Plains and Desert West. Some have looked upon the Altithermal as a cause of human migrations on a grand scale (Husted 1970). Others have viewed it as leading to changes in subsistence strategies and/or settlement patterns (Hurt 1966; Nance 1972; Fagan 1974; Frison 1975; Knox 1976). Still others have argued that its effects upon human cultures were negligible (Jennings 1964; Bense 1971), or that it produced, at most, a short-lived decline in population density (Reeves 1973).

In this paper I suggest that the Altithermal was real, severe, more complex than generally envisioned, felt in virtually all parts of the western United States, and was the cause of population dislocations that affected much of the North American continent.

ALTITHERMAL POPULATION FLUCTUATIONS

The study consists of two parts. The first is a prehistoric census, utilizing all known Altithermal (7500-5000 BP) radiocarbon dates from sites in the central and western United States, southwestern Canada, and northern Mexico. From an initial sample of 340 dates (Benedict and Olson 1978) I have excluded as potentially unreliable all dates based on bone apatite and carbonate, antler carbonate, and shell carbonate; all solid-carbon dates; all dates run in private laboratories; and all dates based on short-lived organic substances (pickleweed chaff, grass thatch, etc.) without correction for isotopic fractionation.

Survivors of this filtering process (171 charcoal and bone collagen dates from 84 sites listed in Figure 1) were used to construct histograms showing the number of sites occupied per radiocarbon century in each of five broad geographic regions (Fig. 2). Population trends are indicated by 500-year running means. None of the dates have been corrected for secular $^{14}C/^{12}C$ variations; the existing bristlecone-pine calibration chronology (Damon *et al.* 1974) does not permit correction of radiocarbon dates older than 6500 BP. (Between 6500 and 5000 BP the length of a radiocarbon century increased by 15%, from 98 to 113 calendar years; estimates of population density based on uncorrected dates should—but do not—show a proportional apparent increase during this interval.)

Several conclusions can be drawn from Figure 2. One is that Altithermal population changes occurred synchronously in many parts of the west; synchroneity implies underlying *regional* causes (such as the introduction of important new technologies, the spread of epidemic disease, regional climatic change, etc.). A second conclusion is that population fluctuations were related

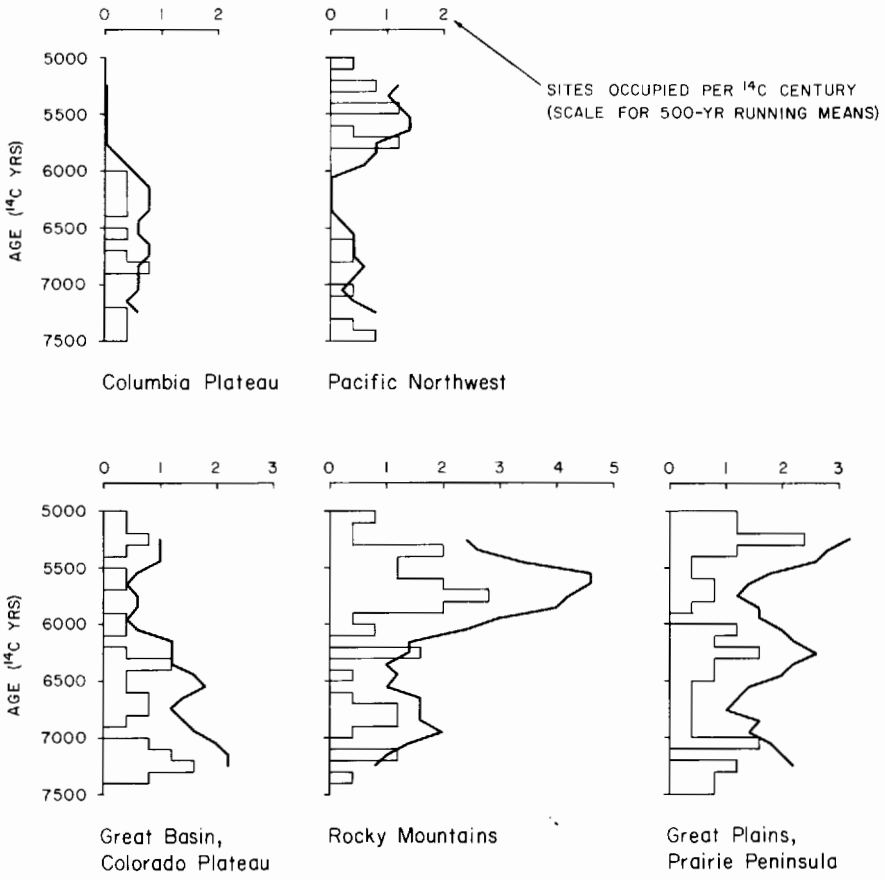


FIGURE 2. Population trends in western North America during the Altithermal. Histograms show the number of archeological sites occupied per radiocarbon century in each of five geographic regions, based on charcoal and bone collagen dates available in 1978. The heavy lines are 500-yr running means.

in some way to changes in *effective moisture* (specifically, to peaks in effective moisture about 7250, 6300, and 5200 radiocarbon years ago, and to drought intervals that climaxed about 6750 and 5700 radiocarbon years ago); otherwise, there is no reason that centers of human population density would have alternated in seesaw fashion between adjacent moist and dry environments.

"Effective moisture" is a general term used in the absence of specific precipitation, temperature, and evaporation data. The component of effective moisture most likely to have produced synchronous-but-opposite population changes in moist and dry environments during the Altithermal is late win-

ter/spring precipitation. Where drought was a principal limiting factor (as in the Great Basin, Colorado Plateau, Columbia Plateau, Great Plains, and Prairie Peninsula), increased spring rainfall would have encouraged human occupation by its favorable effect on plant growth and the abundance and condition of large and small game animal prey species. In cooler, moister environments (such as the Rocky Mountains and parts of the Pacific Northwest), heavy precipitation at the same season would have fallen as snow, affecting human carrying capacity adversely through the linking mechanism of large game animal winter kill.

In summary, population data in Figure 2 suggest that the Altithermal "Long Drought" consisted of two relatively *short* droughts (7000-6500 BP and 6000-5500 BP), separated by an episode of increased late winter and spring precipitation (6500-6000 BP). The second of the two drought intervals affected the largest geographic area, causing possible abandonment of the western plains and dry interior plateaus; reduced population density in the eastern plains, Great Basin, and Prairie Peninsula; a return of people to the moist Pacific Northwest; and an unprecedented burst of occupation along the entire length of the Rocky Mountains. I will examine the effects of this second drought from a Rocky Mountain perspective, using archeological data from the Indian Peaks region of the Front Range, where high-altitude excavations have been in progress since 1963.

FRONT RANGE ARCHEOLOGY, 6000-5500 BP

Introduction

The Indian Peaks are the mountains seen on clear days from Denver. They rise to a maximum altitude of 4115 m, and mark the easternmost extension of the continental divide in North America. They are a region of ragged high summits, broad tundra uplands, cirque glaciers, and deep glaciated valleys. Temperatures at upper timberline are 10°-15°C colder, and annual precipitation 2-3 times greater, than at stations on the shortgrass plains east of the mountains. Strong westerly winds scour the exposed uplands in winter, redepositing dry powder snow in lee-slope snowbanks that have an important buffering effect upon stream flow during dry seasons and dry years. At lower elevations, in the eastern foothills of the Front Range, warm Chinook winds prevent significant winter snow accumulation, keeping forage available for deer, elk, and mountain sheep. Assuming that similar conditions prevailed during past intervals of drought, the Front Range would have been an ideal refuge area for hunters and gatherers faced with a decline in the carrying capacities of nearby semi-arid regions such as the Great Basin, Colorado Plateau, and Great Plains.

Archeological studies show that the Indian Peaks *did*, in fact, experience an influx of people during the drought of 6000-5500 BP. At least three cultural complexes appeared in the region at this time. There is little evidence of interaction between the groups involved, which seem to have maintained their cultural identities despite joint tenancy of a geographically restricted area. I will discuss each complex briefly, emphasizing components at upper timber-

line, but stressing that the broken foothills country on the east flank of the Front Range was also essential to year-round human occupancy of the region.

Albion Boardinghouse Complex

The Albion Boardinghouse Complex is known from surface collections in the Sawatch Range, Medicine Bow Mountains, and Wind River Mountains, and from surface collections and excavations in the Indian Peaks region. The principal excavated site is Albion Boardinghouse (Benedict 1975), located near present timberline in the Green Lakes valley (3260 m elevation). Excavations at the site exposed an unknown thickness of Pinedale (Wisconsinan) ground moraine, overlain by loess, with a superimposed podzolic soil profile. Loess, artifacts, and charcoal in the excavation area are thought to have been redeposited by slopewash from an eroded campsite higher on the morainal slope. The site is the least reliably dated of several sites discussed in this report; a radiocarbon age of 5730 ± 145 BP (I-5020) is thought to apply.

Cultural material from the Albion Boardinghouse site includes 23 medium-sized dart points and point fragments with deep, well-defined side notches and broad, serrated basal concavities (Fig. 3 *a-d*). Chert and chalcedony are the only rock types represented. Projectile point preforms and decortication flakes suggest that tools were manufactured at the site, using chert that may have been quarried near Kremmling, west of the continental divide. Thick bifacial knives and flake end scrapers were also recovered, together with flakes detached during the resharpening of butchering tools. Fragments of a badly-burned cobble handstone and a thick unifacial sandstone milling slab indicate that wild plant foods were processed locally.

The Albion Boardinghouse projectile point style, to my knowledge, is not precisely duplicated outside the Southern and Central Rocky Mountains. General similarities exist, however, with points (cf. Mallory Side-notched points) from sites such as Sudden Shelter, on the Colorado Plateau (Jennings *et al.* in press); Signal Butte, in the shortgrass plains of western Nebraska (Strong 1935; Bliss 1950); and the Scoggin and Pine Spring sites, in the Wyoming Basin (Sharrock 1966; Lobdell 1973). All of the latter are in dry environments; their ages, which range from 4670 ± 140 (RL-475) to 3635 ± 80 (GX-356) radiocarbon years, suggest occupation during the Triple Lakes stade of Neoglaciation (Benedict 1973), when conditions were cooler and moister than the present. As a working hypothesis, I suggest that these complexes evolved from the Albion Boardinghouse Complex, and that their spread into the shortgrass plains, Wyoming Basin, and Colorado Plateau occurred from Altithermal mountain refugia at the onset of Neoglaciation.

Fourth of July Valley Complex

A second cultural complex important in the Front Range during the drought of 6000-5500 BP is known from surface collections in the Indian Peaks and from excavations at the Fourth of July Valley site, near the base of Mount Neva (Benedict and Olson 1973; Benedict in prep.). The Fourth of July Valley site is on a terminal moraine of Satanta Peak (latest Pinedale) age in the

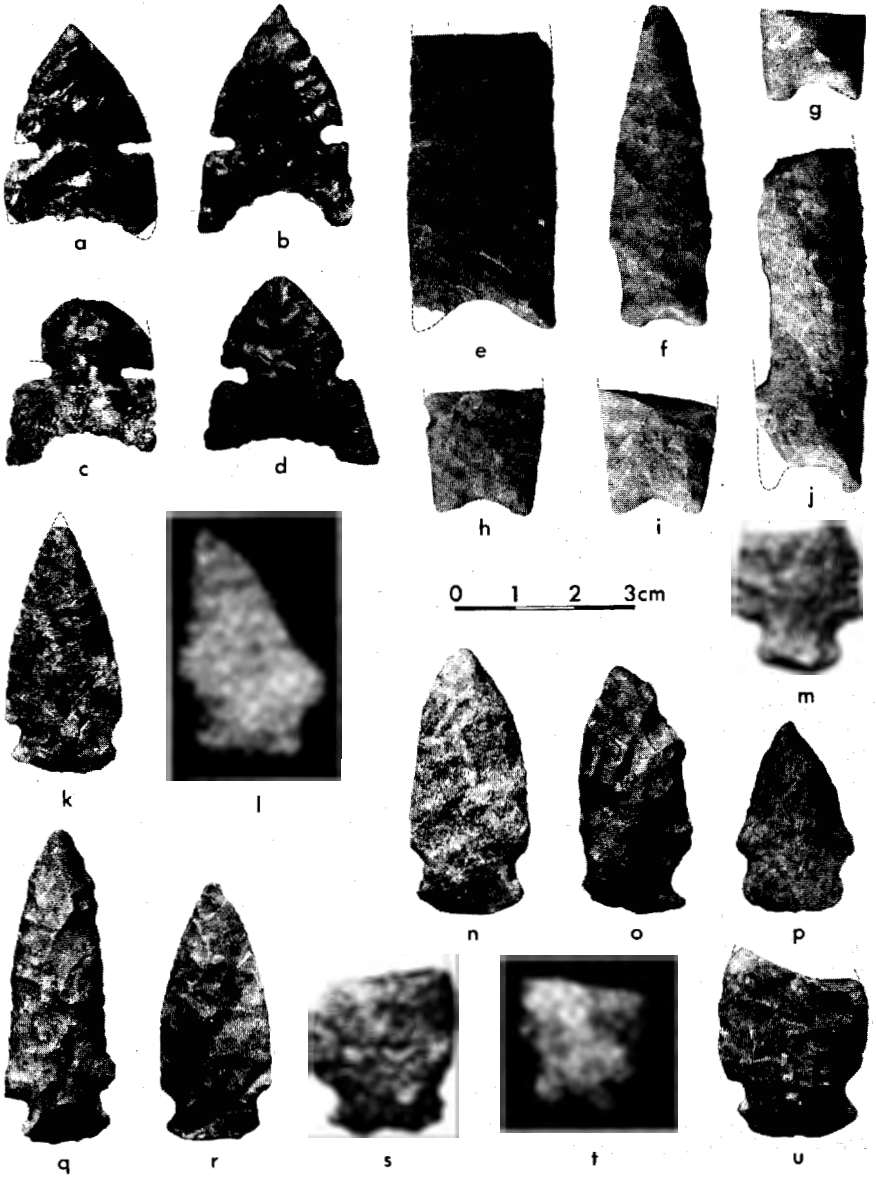


FIGURE 3. Projectile points used in the Indian Peaks during the drought of 6000-5500 BP. *a-d*, Albion Boardinghouse site; *e-j*, Fourth of July Valley site; *k-u*, Mount Albion Complex components, various sites.

forest-tundra ecotone, at an altitude of 3415 m. The crest of the moraine is covered with snow for 9-10 months of the year. A small lake directly upvalley is the remnant of a once-larger water body that drained catastrophically when its dam of glacial till was breached. Till in the excavation area is overlain by proglacial lake silts, stratified glaciofluvial gravels, colluvium, loess, and slopewash sediments. The site is a single-component occupation site, with radiocarbon ages of 5880 ± 120 (I-6544) and 6045 ± 120 (I-6545) years. Resting directly upon the occupation surface, and overlain by loess, are angular boulders that have fallen from the front of a large rock glacier that towers above the excavation area. The absence of such boulders deeper in the stratigraphic sequence suggests that the rock glacier did not approach the site until sometime following occupation, probably during the Triple Lakes stade of Neoglaciation.

Artifacts from the Fourth of July Valley site include bifacial knives, a quartzite chopper, two flake gravers, and a number of small flakes detached during the resharpening of use-dulled tools. There is no evidence that tools were manufactured on the crest of the moraine, or that vegetal materials were gathered and processed. Projectile points and point fragments, numbering 19, are made exclusively of quartzite. They include both lanceolate and stemmed varieties (Fig. 3 *e-j*), some of which show parallel-oblique flaking and alternate edge retouch. The points are intermediate in size, shape, and technique of manufacture between certain late Paleo-Indian forms (cf. James Allen/Pryor Stemmed points) and other Middle Plains Archaic forms (McKean Lanceolate/Duncan points). As a working hypothesis, I suggest that the McKean Complex evolved from ancestral Paleo-Indian complexes in Altithermal refuge areas such as the Colorado Front Range, and that its rapid spread onto the western plains, 5500-5000 radiocarbon years ago, was made possible by the beginning of Neoglaciation.

Mount Albion Complex

A third cultural assemblage important in the Front Range between 6000 and 5500 BP is the Mount Albion Complex (Benedict and Olson 1978), known from excavations at the Hungry Whistler site and site 5 BL 70, above timberline on the slopes of Mount Albion (3500 and 3465 m elevation); from surface collections at 22 additional high-altitude Front Range sites; and from excavations at such foothills localities as Helmer Ranch (Arnold Withers, pers. comm. 1977), the Wilbur Thomas Shelter (Breternitz 1971), Magic Mountain (Irwin-Williams and Irwin 1966), and the LoDaisKa site (Irwin and Irwin 1959). Known occurrences are reviewed elsewhere (Benedict and Olson 1978). Seven radiocarbon ages range from 5800 ± 125 (I-3267) to 5350 ± 130 (I-4419) years. The oldest known stone game-drive structures in the Front Range were built and used by the Mount Albion people; they consisted of low stone walls and/or lines of closely-spaced cairns, without attached blinds for concealment. We do not know what animals were hunted with these early tundra drive systems, although tools from the butchering area at Hungry Whistler appear to have been too small and delicate for use in processing animals as large as bison. Deer, elk, and mountain sheep are possible alternatives.

Artifacts from Mount Albion Complex components include end scrapers, backed knives, irregular flake knives and scrapers, ovoid bifaces, micro-tools, red and yellow ochre, unifacial and bifacial sandstone milling slabs, and irregular cobble handstones. Mount Albion Corner-notched projectile points are small to medium in size, with heavily ground convex bases and heavily ground corner or corner/side notches (Fig. 3 *k-u*); most of the points show evidence of secondary use as hafted knives. Quartzite, argillite, and vein quartz are the principal rock types; the absence of imported lithic materials is a reflection of the prevailing arid climate, which discouraged travel and trade beyond the immediate limits of the Front Range mountain refugium.

The Mount Albion corner-notched projectile point style has no known predecessors in the western United States, perhaps because large areas of the west remain to be systematically explored. To find close analogues of Altithermal age it is necessary to go to arctic tree limit, at sites of the Northern Archaic and Shield Archaic traditions, and to the forests of the northeastern United States (Benedict and Olson 1978). In each of these regions a similar projectile point style appeared abruptly, without local antecedents, during a period of unusual warmth, immediately following an occupational hiatus or period of very low population density; an influx of new people is implied, rather than *in situ* cultural development or the diffusion of new concepts of projectile point design from distant sources to a resident population. As a working hypothesis, I suggest that the ancestors of the Mount Albion people occupied a region (not yet identified) that was susceptible to western drought, and that their movement into the Colorado Front Range, the American and Canadian Arctic, and the moist forests of the northeastern United States was triggered by Altithermal aridity.

CONCLUSIONS

1. Large areas of western North America experienced drought between 7000 and 6500 BP, and again between 6000 and 5500 BP. Both Altithermal droughts were marked by shifts in human population density from dry to moist environments. Geologic evidence is generally compatible with this model; however, geological and palynological methods rarely permit detection and dating of such short-term climatic oscillations, and rarely allow for such unambiguous interpretation.

2. The two-drought Altithermal was interrupted by an episode of increased effective moisture, 6500-6000 radiocarbon years ago, during which centers of human population density shifted to drier environments. A search for glacial and periglacial deposits of mid Altithermal age is currently underway in the Front Range; however, there is no reason to believe that a circulation regime favoring massive winter-kill of large game animals in the eastern foothills of the Rocky Mountains would necessarily also favor development of glaciers in high cirques along the continental divide.

3. The synchroneity of climatic change at middle latitudes in western North America during the Altithermal suggests an overriding, regional control. Fluctuations in the extent and duration of Pacific air masses (Webb and Bryson 1972), affecting human food resources through their influence on late

winter/spring precipitation, are the most plausible explanation for the observed population changes. Times of strong zonal circulation are thought to have favored occupation of the eastern slope of the Rocky Mountains, whereas times of strong meridional circulation are thought to have favored occupation of the plains, and perhaps the Great Basin.

4. Attempts to extend this kind of analysis to other time periods and regions have been unsuccessful due to the multiplicity of factors that can influence human population density. The Altithermal is a relatively simple case: during less severe climatic intervals, and in more temperate environments, it will be difficult or impossible to separate precipitation history from background "noise" using this technique.

5. The number and diversity of cultural complexes present at timberline in the Indian Peaks during the late Altithermal suggest that western archeologists should look to the Rocky Mountains for missing chapters in the culture histories of lower-altitude, drought-susceptible environments. The disappearance of Paleo-Indian hunters from the Northwestern Plains about 7500 radiocarbon years ago, and the appearance of the McKean Complex in the same region after a lapse of 2000-2500 years, are examples of minor archeological mysteries whose solutions lie at least partially in mountain refuge areas.

6. Migration, sometimes on a continental scale, was a successful adaptive response to climatic change during the Altithermal. The appearance of the Mount Albion Complex in the Front Range 5800 radiocarbon years ago, and the nearly simultaneous appearance of similar complexes in arctic timberline environments, cannot be satisfactorily explained without long-distance migration.

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