

Climatic Change and the Northern Plains Archaic

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Until prehistoric man in the Northern Plains became a horticulturist, his livelihood was based upon the exploitation of the natural resources. Since the availability, abundance, distribution, and type of food supply varied with climatic changes, these cycles had a marked effect upon his cultural patterns. For example, during times of severe drought he was probably forced to migrate to regions of higher elevations within the area proper or to the peripheries where different climatic conditions prevailed.

In order to analyze the relationship between climatic changes and the "Archaic" cultural complex in the Northern Plains, several arbitrary definitions and assumptions are necessary. The term "Archaic" as applied originally in Eastern United States referred to those archaeological sites marked by ground and polished stone tools (14). Krieger has noted that the earliest phase, however, was characterized by food grinding tools, such as milling stones, which have surfaces altered from use, not from deliberate grinding and polishing (23). By now, however, the term has been extended to refer to all those cultures, regardless of tool types, that existed in time between those Paleo-Indian cultures (prior to about 10,000 years ago) and 2,000 years ago, when according to Griffin there was a "... gradual change from the initial hunting cultures to the Woodland groups, who had a more stable economic basis and had become more sedentary" (14). In addition, the Archaic peoples, in contrast to the earlier Paleo-Indians exploited a greater variety of natural food products, especially plants. On the other hand the more recent cultures such as the Late Woodland engaged in a small amount of gardening.

The area here referred to as the "Northern Plains" also must be arbitrarily defined since many boundaries can be chosen. For convenience, this area is considered to be that encompassed by the states of Wyoming, Montana, South Dakota, North Dakota, and the southern half of Alberta and Saskatchewan. Although much of the area is flat or rolling grassland, there are many sections of high mountains, buttes, and deep rocky canyons within this state. During prehistoric times, the area as a whole was primarily exploited by hunters of big game animals with gardening confined to some of the major river valleys.

Unfortunately the lack of research makes it impossible to reconstruct the climatic cycles during the past 10,000 years of the Northern Plains on the basis of evidence from this region alone. It is, therefore, necessary to utilize evidence from other regions of the world where more data is available. That such a procedure is feasible is based upon the increasing evidence that the major fluctuations in average thermal levels were and are world-wide in scope. One of the broadest and most detailed studies of climatic cycles is that of Fairbridge, based upon the fluctuating sea levels along stable coastlines (8). The levels of the oceans, the-

oretically, are very sensitive to thermal changes since they reflect the relative amount of water trapped in the form of ice on land as well as that retained in the basins of the seas. It is assumed that in general during cold cycles the levels of the ocean are lower than during thermal maximums.

As yet no attempt has been made to correlate the thermal cycles as revealed by sea levels with the climatic changes of the Northern Plains. Therefore, the relationships here postulated can be considered unproven even though in some instances there is local evidence to support them. With these reservations in mind the writer utilizes these equations: low ocean levels—thermal minimums—moist conditions in Northern Plains—large herds of grazing animals—optimum conditions for hunters. From the point of view of man, however, this equation was the reverse prior to about 7,000 years ago when the climate was too cold and resulted in a large part of the area being covered with continental and mountains glaciers and other ice masses. Another possible exception is the exact time range of sea level changes and climatic shifts for the world as a whole. For example, thermal maximum may have resulted in drought conditions in the Southern Plains sooner than in the North because of the close relationship between locations of wind belts and amounts of of rainfall.

The extent to which a drought for the Northern Plains was reflected in unfavorable conditions for man in a particular local area can not be generalized. Thus, drought may have lessened the water supply on the grasslands, but in mountains areas there still may have been enough permanent water to provide refuges for man. Therefore, man did not necessarily have to completely migrate from the Northern Plains, even during times of extreme drought. Yet it is difficult to believe that for the area as a whole a severe drought of long duration did not result in an actual shrinkage of population, and vice versa when opposite conditions prevailed. The drought in the 1930s drove people out of the Texas and Oklahoma Panhandle regions although not out of all parts of these states.

Moist and Cold Cycle, 10,000-7,600 Years Ago
(8,000-5,600 B.C.)

During this cycle large masses of continental ice sheets and glaciers receded northward, leaving in their place large temporary lakes such as Lake Dakota and Lake Agassiz. By 7500 the temperatures had warmed to the extent that Lake Agassiz had dried up. All during the period, however, large portions of the area between the Rocky Mountains and the Missouri were probably ice-free.

Several camp sites have been excavated in the foothills areas of Wyoming, Montana, and western South Dakota. Judging by the large projectile points, which have basically a lanceolate shape, the economy was based upon the hunting of large game animals, in particular bison that were bigger than the present species. The presence of grinding tools, such as muller, indicates that wild vegetable products were also exploited.

Several of the sites, such as the Finley, Cody, and Horner sites in western Wyoming, include the typical stemmed points of the Scotts-

bluff and Eden types (15, 16). The latter site has been dated by radiocarbon analysis at $6,920 \pm 500$ years ago (20, 21, 25). Other examples are the Long Site on the south edge of the Black Hills with dates ranging from $9,380 \pm 500$ to $7,073 \pm 300$ years ago (6, 17, 25) and the Agate Basin site of eastern Wyoming dated at $9,990 \pm 450$ to $9,350 \pm 450$ years ago (26, 23).

Drought Cycle, (?) 7,000-6,000 years ago
(5,000-4,000 B.C.)

According to Fairbridge's Chart, the level of the ocean was still lower than at present, even though rising, an event theoretically correlated with moist conditions in Northern Plains (8). However, no archaeological site has been excavated in this area that is known to date from this period, a possible indication that unfavorable drought conditions had already ensued. Such conditions are not necessarily inconsistent with Fairbridge's Chart in spite of the time discrepancy, or lag. As previously mentioned the thermal changes that are of world-wide scope do not necessarily affect all local areas simultaneously because of the amount of time necessary for wind belts to shift their location. The lack of sites may also indicate no more than a lack of success by the archaeologists in finding them. Along the peripheries of the area, nevertheless, several sites dating from this time period have been excavated. For example, in eastern Nebraska, the second oldest occupation level of the Logan Creek site was dated at $6,663 \pm 300$ (6). At this site the shallow side-notched projectile points do not closely resemble those from the Northern Plains but are more similar to those from the Simonson Site, 13CK61, of northwest Iowa, dated at $8,430 \pm 520$ (9).

Warm Dry Cycle, 6,000-4,800 years ago
(4,000-2,800 B. C.)

During this cycle the levels of the oceans for the first time since the retreat of the glaciers attained levels higher than that of present (8). According to the assumed correlations, warm dry conditions characterized the Northern Plains. In other regions of the world this thermal maximum has been noted and referred to as the "Hypsithermal" (5), "Altithermal" (1), and "Climatic Optimum." This warm period, postulated by Fairbridge, does not correlate perfectly with the durations of the thermal maximum from other areas of the world referred to by these names. Fairbridge thermal cycle from 6,000-4,800 years ago and others that follow should be considered only as the fluctuations, for example, for the entire period of the "Altithermal" from 7,000 to 4,500 years ago when the temperatures **averaged** higher than present (1).

The sites that so far have been dated as falling within this period all lie in the foothills of the Rocky Mountains where springs probably still flowed in spite of general dry conditions. Apparently the hunting cultures referred to as the "McKean" complex made their appearance during this period. The diagnostic artifact, a lanceolate point with a concave base, is similar in shape to some of those dating prior to 7,000 years ago, although they are smaller in average length.

Sites which have levels containing artifacts of the McKean complex that have radiocarbon dates in this time period include the Grey-

Taylor site (48J0301) in the Middle Fork of the Powder River, Big Horn Mountains, Wyoming, with a time range of $5,230 \pm 185$ to $4,750 \pm 180$; the nearby Sween-Taylor site (48J0301) with the date of $5,030 \pm 150$; and the deep hearth at the Rigler Bluff site (24PA68P), north of Yellowstone Park with an average age of $5,040 \pm 150$ (11, 12, 13).

Cool, Moist Cycle, 4,800-4,000 years ago
(2,800-200 B. C.)

During this short period, Fairbridge's Chart shows the level of the ocean to be slightly lower than at present, indicative of improved living conditions in the Northern Plains (8). In the northern fringes of the plains the water-logged areas which remained from the continental ice sheets had gradually dried up so that by now the area had become attractive to man. This environment is reflected in the wider distribution of the McKean complex and other related groups of hunting cultures. The presence of grinding tools such as mullers and handstones indicates, however, that the collecting of wild vegetable products remained important.

At the previously mentioned rockshelters of Wyoming occupations containing artifacts of the McKean complex have dates that fall within this time range (11, 12, 13). By the end of this period apparently the McKean complex had spread eastward to the Black Hills. For example, the Grant Site (39ME9) in the northern foothills of these mountains has a date of $4,130 \pm 130$ years ago in addition to the typical McKean lanceolate projectile points which include the stemmed indented based type known as "Duncan points," mullers, and handstones (18, 32). In the Angostura Basin in the southern foothills the McKean type of points were found at Site 39FA68153 and 39FA68-145 which had composite dates ranging from $4,230 \pm 350$ to $3,630 \pm 350$ years ago (7).

A slightly different cultural complex of this period is represented at the Powers-Yonkee site (24PR5) of southeastern Montana, which has a date of $4,450 \pm 150$ years ago. Here bison were driven up a dead-end gully where they were trapped and killed. Bison skulls from this site indicate that this animal was larger than the present-day variety. Typical projectile points were elongated and had side-natched indented bases (3).

In the Souris River Valley in southwest Saskatchewan, the oldest occupation level, (No. 9) of the Long Creek Site, dated at 4,993 years ago ($3,043 \pm 125$ B. C.), was associated with at least the inception of this period. The few artifacts found prevent comparison with other cultural complexes of the region (31).

Warm, Dry Cycle, 4,000-3,400 years ago
(2,000-1,400 B. C.)

The high ocean levels for this period, as shown on Fairbridge's Chart, may indicate a return to warm dry conditions in the Northern Plains. Evidence for drought condition has been noted by Wettlaufer at the Mortlach site in south central Saskatchewan, where the oldest artifacts occur in a layer of sand overlying clay, the latter probably deposited during the earlier more moist cycle. This culture, named the

"Thunder Creek," is dated at $3,400 \pm 150$ years ago (30). The main projectile point type, an indented base stemmed variety, is reminiscent of the Duncan type of the McKean cultural complex.

Other than the sites on the northern fringe area few have been located in the Northern Plains proper, and those that have been found with the earlier type of points such as McKean Lanceolate are rare. Instead the major type becomes the smaller corner-notched varieties such as Hanna points (32), as found in upper levels of the previously described site (39J030) of the Big Horn Mountains, dated at $3,750 \pm 167$ (13).

Cool, Moist Cycle, 3,400 to 2,500 years ago
(1,400-500 B.C.)

A period of lower ocean levels (8) that may correlate with cooler and more moist conditions in the Northern Plains. Comparing this cycle with Antev's climatic scheme, it corresponds with the postulated cool phase at the onset of the "Medithermal" (1). Sites are widely distributed in the Northern Plains at this time and are often characterized by corner-notched projectile points such as the Hanna type. The moist conditions may have created an expansion in the grasslands and indirectly resulted in a great increase in the bison herds. The technique of killing bison by driving them over cliffs may have begun at this time.

At the original McKean Site in eastern Wyoming, the artifacts of the McKean complex underly a level with side-notched and corner-notched points of the Hanna types dated at $3,287 \pm 600$ (27). Wheeler has indicated also that while overlap exists, the Hanna types seems more recent (32). For example, at the Mulehead Creek Site (48CK204), northeastern Wyoming, a level dated 850 B.C. (2,800 years ago) (25) contained Duncan, McKean, and Hanna points; while at the Belle Rockshelter (48CK4) in the same general area, only the Hanna types were encountered.

At the Mavrakis-Bentzen Bisop Trap Site (48SH311) in northeast Wyoming, dated $2,600 \pm 200$ years ago, there were a few McKean Lanceolate points, but the majority were a long basal-indented, side-notched type (4). Hanna projectile points were also found in Level 5, Long Creek Site in Saskatchewan, dated $1,413 \pm 115$ B.C. (3,363 years ago) (31). At this site confirmation that this was a moist cycle is indicated by the association of this date with clay and silt layers.

Evidence for killing bison by driving them over cliffs is indicated at the Lance Creek Site of southwest Wyoming dated at approximately 2,500 years (500 B.C.) according to George Agogino (*personal communication*).

Warm, Dry Cycle, 2,500-2,000 years ago
(500-1 A.D.)

During this period there seems to have been a return to another thermal maximum, indicative of warm dry conditions. Evidence is found in the Abrolhos High sea level (83 and in an erosional disconformity at the Long Creek Site in Saskatchewan (31). This cycle also encompasses the Fairbanks Drought of the Southwest as described by Antevs (2).

Other than in the northern fringe of the area, where extreme drought conditions may not have prevailed, few sites from the Northern Plains have been described as yet as falling unquestionably into this period. A deep firepit at the Good Soldier Site (39LM238) in the Missouri Valley of central South Dakota has a date of $2,380 \pm 150$ (6). Neuman, who excavated the site, does not consider that the artifacts of the Woodland complex are necessarily associated with either the fireplace or such an early date. He notes also that the potsherds and other artifacts are comparable to those found on Woodland sites of the Missouri Valley and Central Plains that range in time from 400-1,000 A.D. (28).

At the Long Creek Site there is an unconformity separating the lower Level 5 with the Hanna occupation from the upper Level 4 of the Pelican Lake culture dating at 293 ± 100 B.C. (2,343 years ago) (31). Characteristic of the Pelican Lake complex are corner-notched points with straight or convex bases. At the Mortlach Site the levels containing the Pelican Lake Complex, dated at $2,400 \pm 290$ years ago also are marked by sandy deposits indicative of drought (30).

Climate Like that of Present, 2,000-1,600 years ago
(1 A.D. to 350 A.D.)

Although the levels of the ocean apparently were slightly higher than those at present, this difference was so minor that the climate was about the same as today (8). This period seems to have been correlated with a marked expansion of bison herds correlated with the wide distribution of the "buffalo jump" sites, that is areas where bison were killed by driving over cliffs. One example of a site of this type that has been dated is the Old Women's Buffalo Jump south of Calgary, Alberta, where the two lower levels had a time span from $1,840 \pm 70$ to $1,650 \pm 600$ years ago (10).

The eastern part of the Northern Plains at this time also witnessed the introduction of the Woodland cultural complex from eastern United States, marked by the presence of ceramics and burial mounds. Few of these sites have been dated, but the age of 397 ± 180 from the Sherman Park Mounds near Sioux Falls, South Dakota, supports such a contention (19).

Summary

As a possible yardstick for correlating the cultural and climatic changes in the Northern Plains during the "Archaic" stage (10,000-2,000 years ago), the chart showing the changing ocean levels, made by Fairbridge was utilized (8). Such a procedure was necessary since there has not been sufficient geological research in the Northern Plains to reconstruct the past climatic cycle on the basis of local evidence alone. It is assumed that during this period the following relationship existed: low sea levels—low temperatures—moist conditions for the Northern Plains as a whole—expansion of grasslands—expansion of herds of grazing animals—most favorable conditions for human populations which expanded as a result and vice versa. During unfavorable conditions, that is drought, the populations moved to less effected areas on the peripheries or to regions of higher elevations within the Northern Plains where there may have been permanent streams and springs.

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