# Some Possible Causes for Late-Pleistocene Faunal Extinctions

WILLIAM H. ADAMS, Indiana University

*Abstract*

While Indiana has thus far not yielded a stratified early man site, the distribution of early type projectile points indicates that not only was he in Indiana but that he hunted the Pleistocene megafauna and contributed to their extinction. This paper examines the causes for these faunal extinctions and why, ultimately, the blame rests on man.

Beginning around 15,000 years ago there was a radical reduction in the Pleistocene megafauna. By 9,000 B.P. most had become extinct. These late Pleistocene extinctions were widespread both geographically and interspecifically. They involved areas of the world which were in equal stages of human development: nomadic hunting and gathering. These extinctions were limited to land mammals weighing over 50 kg, the majority being herbivores and their predators (3). Many of these animals have been found in Indiana associated with a tundra-like environment. Since elsewhere in North America under the same conditions these fauna have been found with Clovis projectile points, and Clovis points have been found throughout Indiana, we should eventually find sites which yield the same associations.

A number of forces, biological, geological, and environmental, could have been responsible for these extinctions. Their interrelationships reveal that no single cause was totally responsible.

The biological forces at work are complex. Natural selection will eliminate the unfit, leaving only the best adapted organisms in an environment. Fitness would include: birth of offspring at the right time, length of maturation, adaptation to climate, feeding methods, and predator defense.

If a species fails to adjust the time of the birth of its progeny to meet changing climatic conditions, it may not survive. During periods of lengthening winters, species which cannot adjust their birthing will be selected against; while those that can will have a better chance for survival. Thus a gradual change in climate should cause variation in the time of birth unless another factor overrides the selection process.

Two such factors exist; length of gestation and the size of the individual. The longer the time between mating and birth, the less the assurance of environmental conditions into which the young will be born. In species where mating occurs at the first sign of improving environmental conditions (as in the spring warm-up) and birth shortly after, there will be a better chance of survival than those species that have long gestation periods.

Since larger animals have longer gestation periods, and greater body size usually requires proportionately more time for maturity to be reached, a change in climate would have greater impact upon the larger animals.

An organism must be able to adapt to a new or changing environment. During this period, between 15,000 and 9,000 B.P., the climate was slowly changing and with it the available food supply. Thus, in order to survive, the existing fauna had two courses available; a change in diet, or migration. If the species were physically able, they would follow the changing ecological zones, but if trapped by local physical features (such as mountains or rivers) they would have to change their diet. For some species, in some areas, the ability to migrate would be cut off by the new vegetation cover which, unless they were preadapted, would be as formidable a barrier as a mountain.

There exists in nature a predator-prey balance that could, if upset enough, result in the extinction of one or both. Some of the causes which could upset this balance include: extinction of the major predators, environmental forces which cause gregarious fauna to scatter into small groups less able to protect themselves and their young, change in the individual method of predator defense, and the introduction of a highly efficient predator.

By approximately 15,000 the saber-toothed cat, *Smilodon,* was extinct. If *Smilodon* played an important role in holding the herbivore population to a level compatible with available vegetation, then what would be the result if this predator pressure were released? If the extinction of *Smilodon* was gradual, other predators would increase in numbers, but since these smaller predators would not be able to fill *Smilodon's* niche completely, the result would be an increase in the population of herbivores. A large increase would cause the cycle of overgrazing—starvation—low population—vegetation recuperation—overpopulation—ad infinitum. This cycle would occur in a more severe manner if *Smilodon* were exterminated in a short period by an epidemic disease and thus, lacking that predator's pressure, the herbivore population would increase to numbers which could not be maintained by the food supply.

A vegetation change which resulted in the desired food plants becoming scarce would limit the number of animals and would be selective against large herds, scattering them. This would have disadvantaged species that were dependent upon group defense. Those species that could fight or outrun their foes increased their chances for survival.

The addition of an efficient predator to an environment usually has wide effect. Naked man as a predator was not very efficient. He lacked the claws, teeth, and stamina of a predator. With tools he increased the efficiency but not until he possessed a projectile point did he become a very efficient killer. Man has been a significant force in the selection of some fauna over others. Man's ability to kill a particular animal at a certain time varied with his ingenuity; but, in general, he tended to kill the smaller fauna. Until the advent of the projectile point, he was a selective force towards larger and harder to kill animals since his limited hunting ability forced him to select the smaller individuals. With the projectile point, the larger animals were more easily within his grasp and the forces of selection favored a smaller and fleeter fauna.

If we assume that climatic conditions were about the same during this period (15,000-9,000 B.P.) as during the other post-glacial periods, then climatic changes, per se, cannot be the cause of these extinctions. These climatic conditions were important as contributing factors. By limiting the land area by covering it with glaciers and changing the flora, they no doubt decreased the animal population. Since conditions in post-glacial periods were similar, then the late Pleistocene post-glacial faunal extinctions must be the result of an additional factor not present in earlier periods: MAN.

Man has been in the New World for over 35,000 years, yet until about 11,000 years ago did not possess a stone projectile point. Before that date he used bone points or none at all. With the addition of the highly efficient fluted Clovis point man could become the major force in the extinctions. While the origin of the Clovis point is still unknown its effects are widely known. Either by migration or diffusion the Clovis points had spread in only a few decades throughout most of the habitable portions of North America. These points reflect not only the game which were killed but also the distribution of the various species at the time they were killed (W. H. Adams, unpublished data).

Dorwin lists 87 Clovis-like fluted points found in Indiana (2). All were surface finds and were distributed throughout the state. The Ohio River area from Posey County upstream to Clark County accounts for 1/3 of the points. Another 1/3 are found in the remaining southern half of Indiana. Thus there is a decrease in the frequency as one moves northward. For the later Folsom points a proportionately greater number (11/26) are found in the northern half of the state than were Clovis points. This would indicate that at least two migrations of different cultures occurred; one sometime after 15,000 B.P. and the other sometime afterwards as the tundra was leaving Indiana, since the animals with which Clovis and Folsom are usually associated, mammoth, mastodon, bison, would have been available at that time in Indiana. We can assume that the hunting of those animals was the cause for the presence of those points in Indiana, since man would have followed these megafauna northward across the tundra until the end of the tundra—the ice sheet—was reached; also that the northernmost distribution of fluted points marks the place where man and animal could go no further north and soon killed off the few remaining megafauna. This line, the Mason-Quimby Line, marks the end of a biological era and technological stage.

However, man is often given too much credit for these extinctions. While his many methods of killing animals, such as snares, pitfalls, stampedes, and fire drives could kill off all available animals, it was only with a projectile point that man could affect a species quickly enough to cause extinction, in the period under examination here.

Perhaps the most overrated possible causes for extinction has been the fire drive. Whether or not the fire drive was used at an early date in the New World, it has been pointed out that, at least in the savanna in southern Africa's Kruger National Park, the overall effect of fire

would be helpful to the grazer. There Brynard (2) found that when fire was prevented the amount of brush increased and left smaller areas of grazing land. The same situation should have occurred on the North American savanna. By using fire drives man would have aided the grazers, mammoth and bison, and hurt the browsers, sloth and mastodon.

## Conclusions

A combination of biological and environmental forces reduced faunal populations during the glacial and post-glacial times. By 9,000 B.P. many of those species were extinct. The changing climate was not the cause since in previous glacial periods there had been no extinctions and, at the time of these major extinctions, the environment was actually improving for these species. The only differences between this post-glacial period and the others was man, not his presence, but by his possession of weapons which could affect these large animals. These late-Pleistocene extinctions would appear to have no single cause but instead to be the result of an untimely combination of factors. Thus not only was man in Indiana in the period between 15,000 and 9,000 B.P. but also he was most likely a significant factor in the extinction of several Pleistocene megafauna. For that reason we must concentrate our search for early man sites in Indiana and the Midwest which will yield artifacts which are in association with those extinct fauna.

## Literature Cited

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