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Mammoth tracks indicate a declining Late Pleistocene population in southwestern Alberta, Canada

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Abstract

Much debate has raged over the role that early humans played in this most recent large extinction. Fossil mammoth (*Mammuthus primigenius*) footprints were discovered at the St. Mary Reservoir in southwestern Canada (Wally's Beach DhPg-8). They are located in aeolian sediment dated at 11,300–11,000 years BP. By comparing the size distribution of these tracks with those of modern African elephants (*Loxodonta africana*), the age distribution of this mammoth population was determined. Containing far fewer juveniles than would be expected for an expanding or stable population, these tracks provide the first evidence that a living mammoth population, coexisting with human inhabitants, was in decline. Additionally, the same site provides corroborating evidence of humans hunting megafauna (horse and bovids). This suggests that humans, in addition to climate change, played a role in the end Pleistocene extinctions in North America.

1. Introduction

The St. Mary reservoir site in southern Alberta (Wally's Beach DhPg-8, Fig. 1) provides a rare detailed look at the latest Pleistocene megafauna of Canada. The association of the skeletal remains of *Bison antiquus*, *Bootherium bombifrons*, and *Equus*, as well as tracks of camelids, bovids, cervids, equines and mammoths suggests a late Pleistocene age. AMS dates on skeletal material from the site indicate an age of 11,300–11,000 radiocarbon years BP (Fig. 2; Hills et al., 1999; McNeil et al., 1999; Kooyman et al., 2001). The site is also important archaeologically as worked stone tools and points of Clovis age (11,500–11,000 years BP) indicate that this is one of the oldest well-dated occupied sites in Canada. This is a critical time period in North America as the earliest Paleoindian peoples are interacting with the soon to be extinct megafauna.

2. Location and site description

The St. Mary site is located 2 km west of Wally's Beach on the St. Mary Reservoir northeast of Cardston in southern Alberta (Fig. 1). Access to the site became possible with the lowering of the reservoir water level for spillway construction. This allowed significant wind erosion of the unprotected reservoir floor, removing at least 1.5–2 m of sediment, and exposing trackways, skeletal remains, and archaeological material (Hills et al., 1999). The site is approximately 1.5 km in length and 0.5 km wide and follows the eastern bank of what would have been the St. Mary River channel just after deglaciation. Located at one of the few gentle slopes down to the palaeo-river valley floor, the abundance of tracks, skeletal material, and cultural artifacts is explained, as this was one of the few locations that

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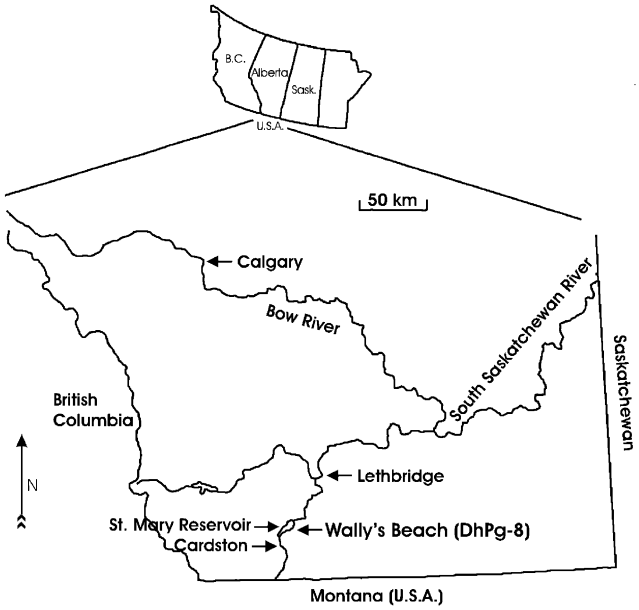

Fig. 1. Location of Wally's Beach Site DhPg-8.

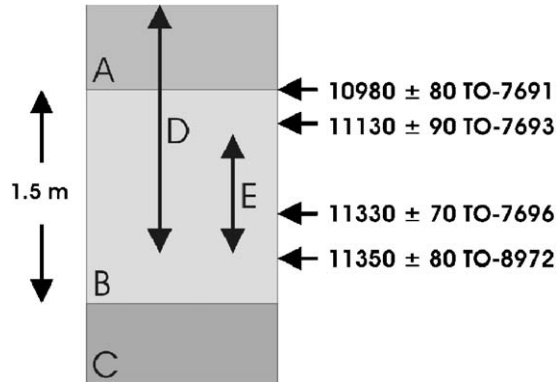

Fig. 2. Simplified stratigraphic column of the track bearing sediments at the St. Mary Reservoir. Sedimentary units; (A) well developed paleosol, (B) aeolian silts and sands, (C) proglacial deltaic and lacustrine sands and gravels. Location of mammoth tracks within the stratigraphic column; (D) entire range of tracks (tracks to the upper end of this range become increasingly rare and indistinct), (E) range of tracks used in this study, tracks are common and well preserved. Dates are uncorrected AMS radiocarbon dates (IsoTrace Radiocarbon Laboratory, corrected for isotopic fractionation) of skeletal remains; TO-7691 *Bootherium bombifrons* (extinct helmeted musk oxen), TO-7693 *Bison antiquus* (extinct bison); TO-7696 *Equus conversidens* (extinct horse), and TO-8972 *Rangifer tarandus* (caribou).

provided easy access to water. The palaeontological and archaeological remains are found in a 1.5 m thick band of aeolian silts and sand that are the result of the deflation of glacial influenced river flood plains to the west (Fig. 2). These aeolian sediments are porous and unconsolidated and show no evidence of a well-developed paleosol. Extensive root etching on the skeletal elements and in situ root bases indicate that this was a lush grassy plain with some low shrubs, kept fertile by the input of glacial loess (Laxton et al., 1996). Overlying this deposit is a well-developed palaeosol signifying the re-vegetation of the flood plains and the end of large quantities of windborne sediment input to the site.

3. Description of tracks

Few Pleistocene localities of proboscidean tracks are known (Cabral-Perdomo and Applegate, 1991; Haynes, 1991; Kinahan et al., 1991; FRG, 1992; Fisher, 1994) and the tracks found at Wally's Beach are the first recorded in Canada. A great number of individual tracks as well as many trackways of fossil proboscideans have been discovered at the St. Mary Reservoir (Figs. 3 and 4). The tracks are imprinted in unconsolidated poorly bedded aeolian silts and fine-to-medium grained sands (Fig. 2; McNeil et al., in press). A large raised deformation rim surrounds each true track, indicating

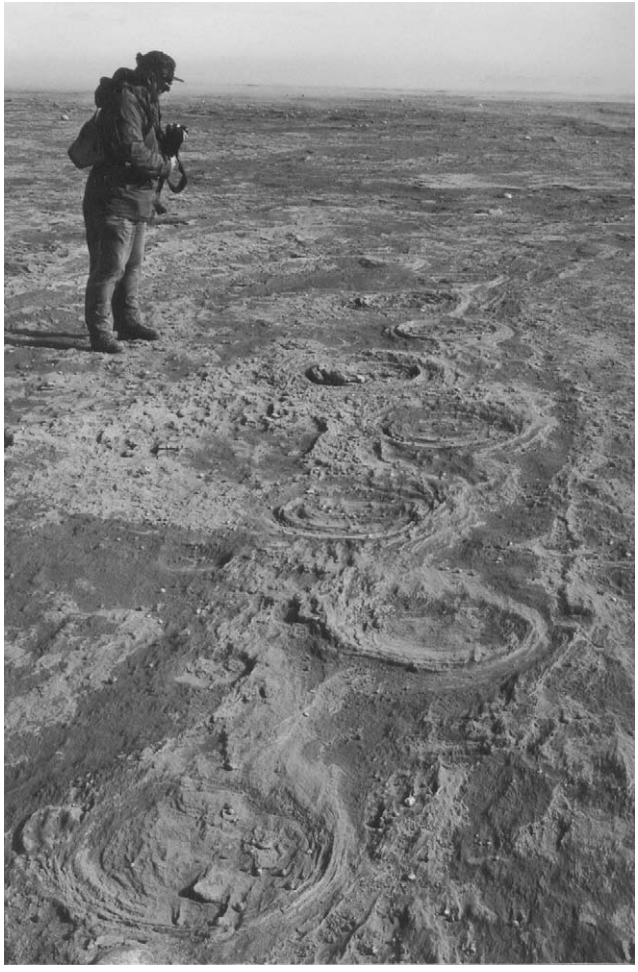

Fig. 3. First mammoth trackway identified from the St. Mary Reservoir site DhPg-8. Trackway consists of nine tracks. Note L.V. Hills for scale.