

Timing, causes, and ecological consequences of Pleistocene mammal and bird extinctions in North America: a regional analysis

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Dozens of species of large mammals and birds (“megafauna”) disappeared from North America at the end of the Pleistocene. These extinctions were part of the largest global extinction event of the Cenozoic, but the timing of these losses is too poorly-constrained to distinguish between potential causes including climate change, human predation, and other factors. To better understand the causes and dynamics of these extinctions, our team obtained hundreds of new, high-precision radiocarbon dates on extinct mammals and birds from across the continental U.S. and southern Canada. In many regions of the continent, mammal extirpations appear to be nearly synchronous, with megafauna in southern California, the Southwestern United States and the Midcontinent all disappearing within a two-century span during the time of Clovis. Later persistence of some taxa in the northeastern United States and southern Canada may reflect relict populations tracking dwindling habitat. In southern California (the only region with a well-resolved bird record), avian megafauna were extirpated coincident with the large mammals, approximately 13,000 years ago. Comparison with regional paleoclimatic, archaeological and vegetation records suggests that these extinctions were likely caused by synergistic interactions between climate change and human activities, including droughts, hunting, and human-ignited wildfires, which disrupted ecosystems and caused food webs to collapse. Notably, several species of mammalian and avian megafauna previously presumed to be “Pleistocene survivors” appear to have either first entered non-Beringian North America in the early Holocene, or retreated to refugia after the extinction before repopulating their prior range in the mid- to late-Holocene. This suggests that the Pleistocene extinction event in North America was even more catastrophic than previously thought, wiping out nearly all large-bodied taxa from most of the continent for thousands of years.