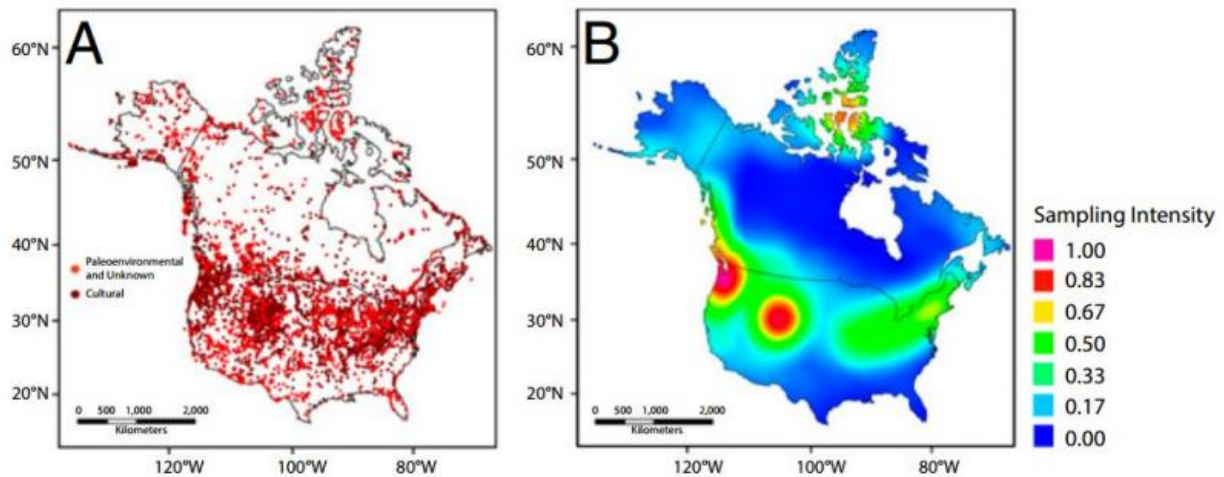


Data analysis yields striking maps of human expansion in North American Holocene

September 16 2015, by Christopher Packham



Locations of the archaeological sites in the CARD and the sampling intensity base map. Credit: *PNAS* 2015 ; published ahead of print September 8, 2015, doi:10.1073/pnas.1505657112

(Phys.org)—The Holocene began approximately 11,700 years ago, and encompasses the entire history of human civilization, all known written records, the epochs of human migrations, and the development of modern urban civilization. In the absence of written records from deep human history, paleohistorians have only the archaeological record to establish the spread of humanity across time and space, and there are known gaps in our knowledge of human expansion. Some of those gaps in the historical record occurred around the time that the Cordilleran and

Laurentide ice sheets retreated and allowed human colonization of North America.

Recently, a group of paleoclimatologists and anthropologists analyzed data recorded in the Canadian Archaeological Radiocarbon Database (CARD), which aggregates 35,905 radiocarbon samples from [archaeological sites](#) across the North American continent, and was created by Dr. Richard Morlan of the Canadian Museum of History. By applying a kernel density estimation method to the data, the researchers produced the first maps of temporally distinct paleo-demographic trends that correspond well to existing evidence of human expansion across North America in the Holocene. They've published their results in the *Proceedings of the National Academy of Sciences*, which include paleo-demographic insights across a 13,000-year span.

Alaska

Radiocarbon frequency population estimates (RFPEs) fluctuate steadily across the entire investigated span, as expected—Alaska was the location of repeated migrations into the Americas. These estimates peaked in Northern and Central Alaska around 11,500 years ago, corresponding with the rise of technologies characteristic of Paleoindian groups in the [archaeological record](#). The development of Thule culture coincides with the occupation of the majority of the Alaskan region around 1,000 years ago.

Canadian Arctic

RFPEs support recent genetic evidence of human activity in the region 6,000 years ago. By 4,000 years ago, the researchers find signs of human occupation all across the region. They note that the map data produces a population site in Nunavut around 9,500 years ago that was known to be glaciated at the time, and that this is a product of the chosen resolution

of their data: "The spatial extent of this population is a product of the kernel radius chosen (600 km); a larger radius would merge this population with its Western neighbor. Although these dates seem inconsistent with the ice extent (which is, however, based on radiocarbon data), it is reasonable to hypothesize that humans were found along the edge of the ice at this time."

British Columbia and the Ice-Free Corridor

It was 13,500 years ago, as the Pleistocene began yielding to the Holocene, that the ice-free corridor opened between the Laurentide and Cordilleran ice sheets, allowing human migration via an interior route for the first time. Around 11,500 years ago, RFPEs along the west coast of British Columbia increase, corresponding with archaeological evidence of maritime communities in the region. At 5,500 years ago, the maps show a spike of [human](#) populations, perhaps corresponding with the stabilization of coastal sea levels and the development of new trap and tool technologies east of the Rockies.

Eastern U.S.

A number of archeological studies indicate a strong presence of Paleoindians in the southeast starting around 9,500 years ago; indeed, the current study produces increased RFPEs in the region, which grew larger and expanded northward and westward during this span. "Estimates fluctuated until 4.9 ka when populations grew to the east and west of the Appalachians as well as in the Middle Atlantic and New England regions," the authors write.

They conclude, "These results illustrate the value in applying advanced statistical methods to aggregate ^{14}C data from archaeological databases... These results suggest that the CARD is a highly useful archive of

paleodemographic data that can be used to investigate subjects such as migration routes into and across North America as well as a valuable tool for studies linking anthropogenic impacts with post-ice age faunal extinctions, ecosystem decline, and changing environmental and climatic conditions."

More information: "Spatiotemporal distribution of Holocene populations in North America." *PNAS* 2015 ; published ahead of print September 8, 2015, [DOI: 10.1073/pnas.1505657112](https://doi.org/10.1073/pnas.1505657112)

Abstract

As the Cordilleran and Laurentide Ice Sheets retreated, North America was colonized by human populations; however, the spatial patterns of subsequent population growth are unclear. Temporal frequency distributions of aggregated radiocarbon (^{14}C) dates are used as a proxy of population size and can be used to track this expansion. The Canadian Archaeological Radiocarbon Database contains more than 35,000 ^{14}C dates and is used in this study to map the spatiotemporal demographic changes of Holocene populations in North America at a continental scale for the past 13,000 y. We use the kernel method, which converts the spatial distribution of ^{14}C dates into estimates of population density at 500-y intervals. The resulting maps reveal temporally distinct, dynamic patterns associated with paleodemographic trends that correspond well to genetic, archaeological, and ethnohistoric evidence of human occupation. These results have implications for hypothesizing and testing migration routes into and across North America as well as the relative influence of North American populations on the evolution of the North American ecosystem.

© 2015 Phys.org

Citation: Data analysis yields striking maps of human expansion in North American Holocene

(2015, September 16) retrieved 22 June 2024 from <https://phys.org/news/2015-09-analysis-yields-human-expansion-north.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.