National Park Service
U.S. Department of the Interior

Rocky Mountain National Park
Continental Divide Research Learning Center

Climate Change & Prehistoric Human Migration

The Question: How has prehistorical climate change influenced where people lived in the Rocky Mountain National Park (RMNP) region?

Humans select areas to live in with a hospitable climate, sufficient food, shelter, and other life-sustaining resources. Archeologists combine information on these environmental variables with artifacts to learn where and how man lived.

The Project: Evaluate various paleoenvironmental resources to determine the relationship between human population movements and climate change.

A team of scientists from the University of Northern Colorado, led by Dr. Robert Brunswig and Dr. Jim Doerner, studied the influence of climate change on prehistoric cultural resources in RMNP, especially as they relate to determining where people lived. This team used many methods to learn about the environmental conditions present when people occupied these landscapes. These methods included pollen analysis, lichen chronology, tree-ring chronology, paleoentomological studies, and radiocarbon dating.

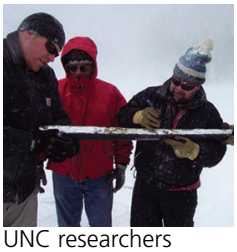

UNC researchers conduct core sampling at Bighorn Lake in 2000.

Pollen analysis microscopically identifies pollen found in different layers of cores removed from lakebeds or wetlands to determine the dominant vegetation present during the time that layer was deposited. Lichen chronology uses the known growth rate of different lichen species to estimate the exposure time of selected lichen patches at archeological sites to determine how long people lived in an area. Tree-ring chronology is used to chronicle past wet periods and droughts by examining the widths of annual growth rings. Paleoentomological studies, similar to pollen analysis, document the presence of various insects at different times by comparing decay-resistant insect body parts with known ages of the deposit. Radiocarbon dating of prehistoric campsites and game-drive systems also provides important information on the age of organic samples.

The Results: Warming and cooling periods have been documented for the RMNP region and the movement of human populations has coincided with these changes.

Research indicates that significant changes in climate and vegetation took place during the last 14,000 years in RMNP. The post-glacial warming between 14,000 and 11,000 Before Present (BP) that caused glaciers to retreat was followed by a short cool period, which lowered the tree line and caused glacial valleys to advance. This cool period was followed by a warm period from 10,000 to 8,000 BP. At Lawn Lake Fen, warmer summers and longer growing seasons produced rapid peat growth. Between 8,000 to 4,500 BP the climate was warm with dry summers, however this time was not as warm as the previous period. In Beaver Meadows, higher temperatures and lower effective precipitation caused the disappearance of wetlands from valley bottoms. Over the past 4,500 years warm and cool cycles have alternated with modern conditions likely established during the past 2,000 years.

Studies indicate humans migrated between low and high elevations along the Colorado Front Range, including RMNP. People and game (e.g., elk, deer, sheep) occupied higher altitudes during warmer periods and retreated to lower, less severe elevations during colder temperatures and increased snow cover. Analyses of campsites, game-drive systems, and lichen chronologies indicate areas above timberline were snow covered at least 40 weeks a year on average during periods between 1,000 and 3,200 BP. These studies also indicated that radiocarbon dates could be used to determine climate change impacts and provide a chronological framework to help interpret paleoenvironmental data in the absence of climatological records.


UNC researchers examine an extracted core near Bear Lake.

These studies have revealed two important aspects of climate change in the RMNP paleoenvironment: (1) alternating periods of warming and cooling occurred and (2) the movements of humans in the park followed these climate changes, moving where resources were abundant and conditions were relatively comfortable.

This summary is based on published, peer-reviewed and/or unpublished reports available at the time of writing. It is not intended as a statement of park policy or as a definitive account of research results.
For more information on the park's research program, see www.nps.gov/romo
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