

Man-made global warming started with ancient hunters: study

June 30 2010

Even before the dawn of agriculture, people may have caused the planet to warm up, a new study suggests.

Mammoths used to roam modern-day Russia and North America, but are now extinct—and there's evidence that around 15,000 years ago, early hunters had a hand in wiping them out. A new study, accepted for publication in [Geophysical Research Letters](#), a journal of the American Geophysical Union (AGU), argues that this die-off had the side effect of heating up the planet.

"A lot of people still think that people are unable to affect the climate even now, even when there are more than 6 billion people," says the lead author of the study, Chris Doughty of the Carnegie Institution for Science in Stanford, California. The new results, however, "show that even when we had populations orders of magnitude smaller than we do now, we still had a big impact."

In the new study, Doughty, Adam Wolf, and Chris Field—all at Carnegie Institution for Science—propose a scenario to explain how hunters could have triggered global warming.

First, [mammoth](#) populations began to drop—both because of natural [climate change](#) as the planet emerged from the last ice age, and because of human hunting. Normally, mammoths would have grazed down any birch that grew, so the area stayed a grassland. But if the mammoths vanished, the birch could spread. In the cold of the far north, these trees

would be dwarfs, only about 2 meters (6 feet) tall. Nonetheless, they would dominate the grasses.

The trees would change the color of the landscape, making it much darker so it would absorb more of the Sun's heat, in turn heating up the air. This process would have added to natural climate change, making it harder for mammoths to cope, and helping the birch spread further.

To test how big of an effect this would have on climate, Field's team looked at ancient records of pollen, preserved in [lake sediments](#) from Alaska, [Siberia](#), and the Yukon Territory, built up over thousands of years. They looked at pollen from birch trees (the genus *Betula*), since this is "a pioneer species that can rapidly colonize open ground following disturbance," the study says. The researchers found that around 15,000 years ago—the same time that mammoth populations dropped, and that hunters arrived in the area—the amount of birch pollen started to rise quickly.

To estimate how much additional area the birch might have covered, they started with the way modern-day elephants affect their environment by eating plants and uprooting trees. If mammoths had effects on vegetation similar to those of modern elephants, then the fall of mammoths would have allowed birch trees to spread over several centuries, expanding from very few trees to covering about one-quarter of Siberia and Beringia—the land bridge between Asia and Alaska. In those places where there was dense vegetation to start with and where mammoths had lived, the main reason for the spread of birch trees was the demise of mammoths, the model suggests.

Another study, published last year, shows that "the mammoths went extinct, and that was followed by a drastic change in the vegetation," rather than the other way around, Doughty says. "With the extinction of this keystone species, it would have some impact on the ecology and

vegetation—and vegetation has a large impact on climate."

Doughty and colleagues then used a climate simulation to estimate that this spread of birch trees would have warmed the whole planet more than 0.1 degrees Celsius (0.18 degrees Fahrenheit) over the course of several centuries. (In comparison, the planet has warmed about six times more during the past 150 years, largely because of people's greenhouse gas emissions.)

Only some portion—about one-quarter—of the spread of the birch trees would have been due to the mammoth extinctions, the researchers estimate. Natural climate change would have been responsible for the rest of the expansion of birch trees. Nonetheless, this suggests that when hunters helped finish off the mammoth, they could have caused some [global warming](#).

In Siberia, Doughty says, "about 0.2 degrees C (0.36 degrees F) of regional warming is the part that is likely due to humans."

Earlier research indicated that prehistoric farmers changed the climate by slashing and burning forests starting about 8,000 years ago, and when they introduced rice paddy farming about 5,000 years ago. This would suggest that the start of the so-called "Anthropocene"—a term used by some scientists to refer to the geological age when mankind began shaping the entire planet—should be dated to several thousand years ago.

However, Field and colleagues argue, the evidence of an even earlier man-made global climate impact suggests the Anthropocene could have started much earlier. Their results, they write, "suggest the human influence on climate began even earlier than previously believed, and that the onset of the Anthropocene should be extended back many thousands of years."

More information: "Biophysical feedbacks between the Pleistocene megafauna extinction and climate: The first human-induced global warming?", *Geophysical Research Letters*

Provided by American Geophysical Union

Citation: Man-made global warming started with ancient hunters: study (2010, June 30) retrieved 3 May 2024 from <https://phys.org/news/2010-06-man-made-global-ancient-hunters.html>

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