Causes of Extinctions?

Around 12,800 years ago, tens of millions of large animals abruptly became extinct, including mammoths, mastodons, saber-toothed tigers, giant armadillos, giant beavers, American camels, American horses, and huge dire wolves.

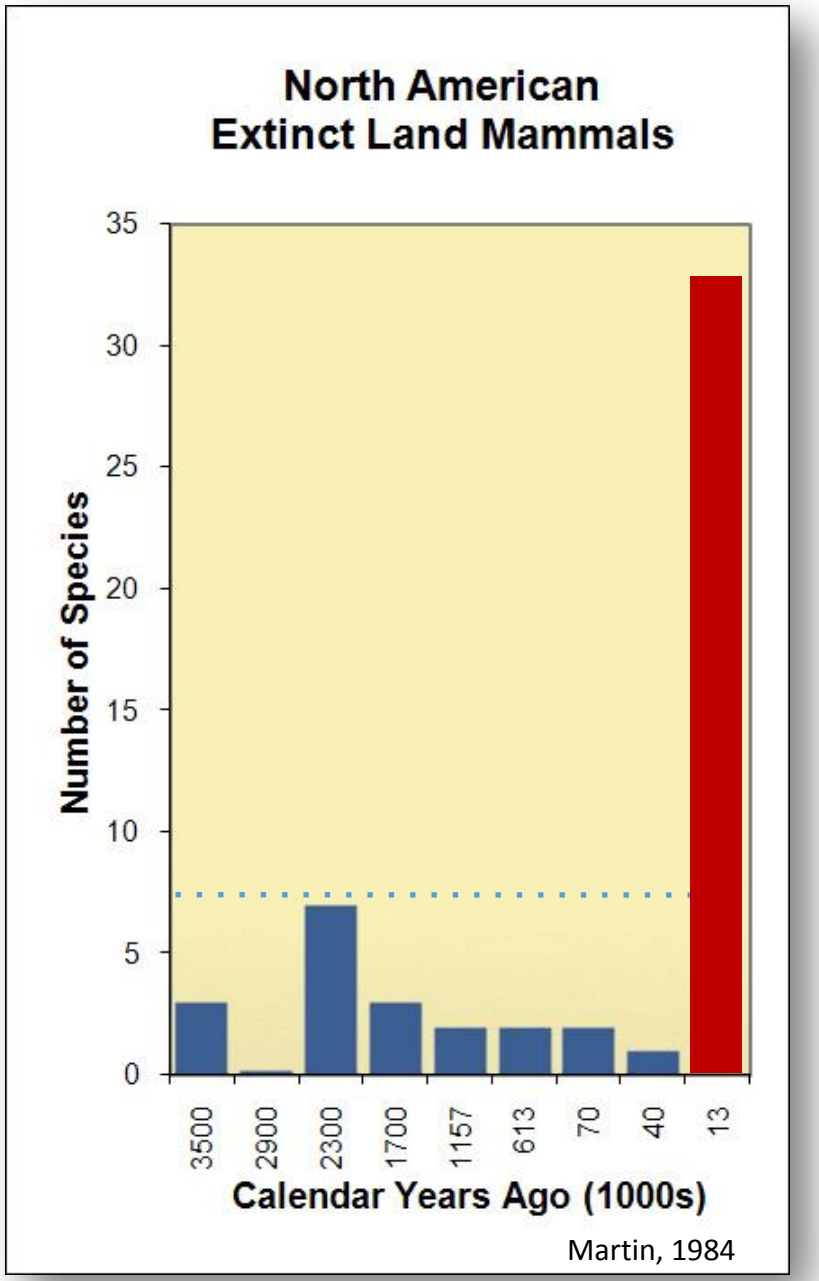
So, what happened? There are three proposed explanations:

(1) Younger Dryas climate change. Cold climate certainly causes population declines, but extinctions are rare. This idea doesn't fit the facts very well, because in the last two million years, these extinct animals had survived a dozen episodes of severe cold that were worse than the Younger Dryas.

(2) Hunting by humans (Overkill). This scenario says that Clovis people arrived in North America and found a continent teeming with animals. They had no fear of humans, who simply slaughtered them. It is unlikely that only a few tens of thousands of hunters could cause the extinction of tens of millions of animals, including wolves and tigers that were not considered to be food.

(3) The Younger Dryas impact. Impacts are well known to cause extinctions. The combination of the impact and the other two is the best explanation.

NOTE: this website is a brief, non-technical introduction to the YDB impact hypothesis. For in-depth information, go to "Publications" to find links to detailed scientific papers.



The Extinctions

For large mammals in North America, the background extinction levels over the last 3.5 million years were low at an average of less than one species every 160,000 years

Then, around 12,800 years ago, the number of extinctions jumped to 35 species within just a few 1000 years, due to the YDB impact.

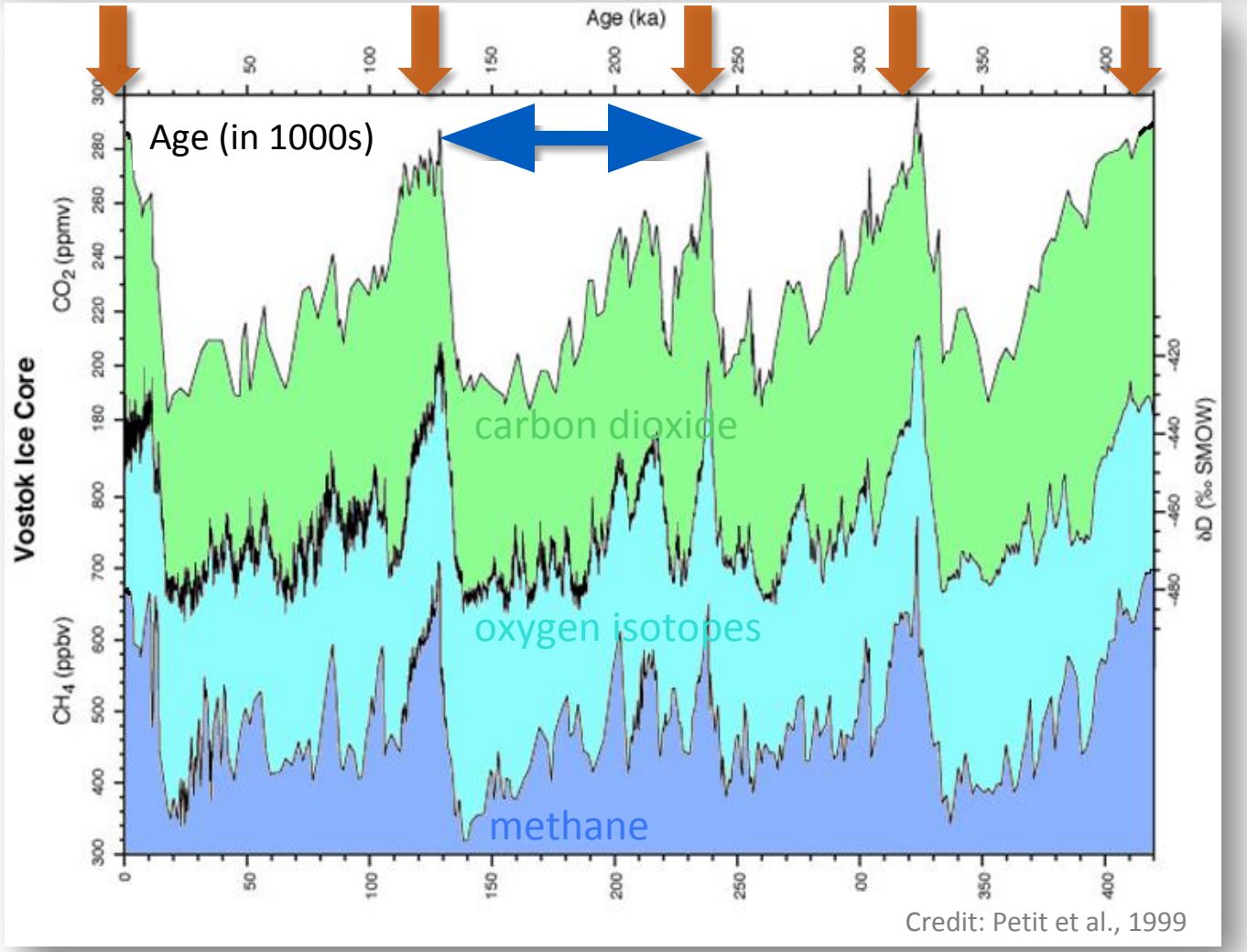
This is about 2,000 times the previous levels

The last major extinction event was 14.5 million years ago at the time of an impact that created the 24-km-wide (15 miles)

Ries Crater in Germany

Problems with Climate Change

- Past temperatures are inferred from concentrations of carbon dioxide, oxygen isotopes, and methane
- Each past ice age involved a long period of cooling followed by brief warming (peaks at orange arrows)
- Most ice ages cycles lasted about 100,000 years (blue double arrows)
- Prior to the Younger Dryas (YD), temperature drops were far more severe than at YD, but there were no waves of extinctions
- This strongly indicates that climate change was not the only cause of the extinctions 12,800 years ago.

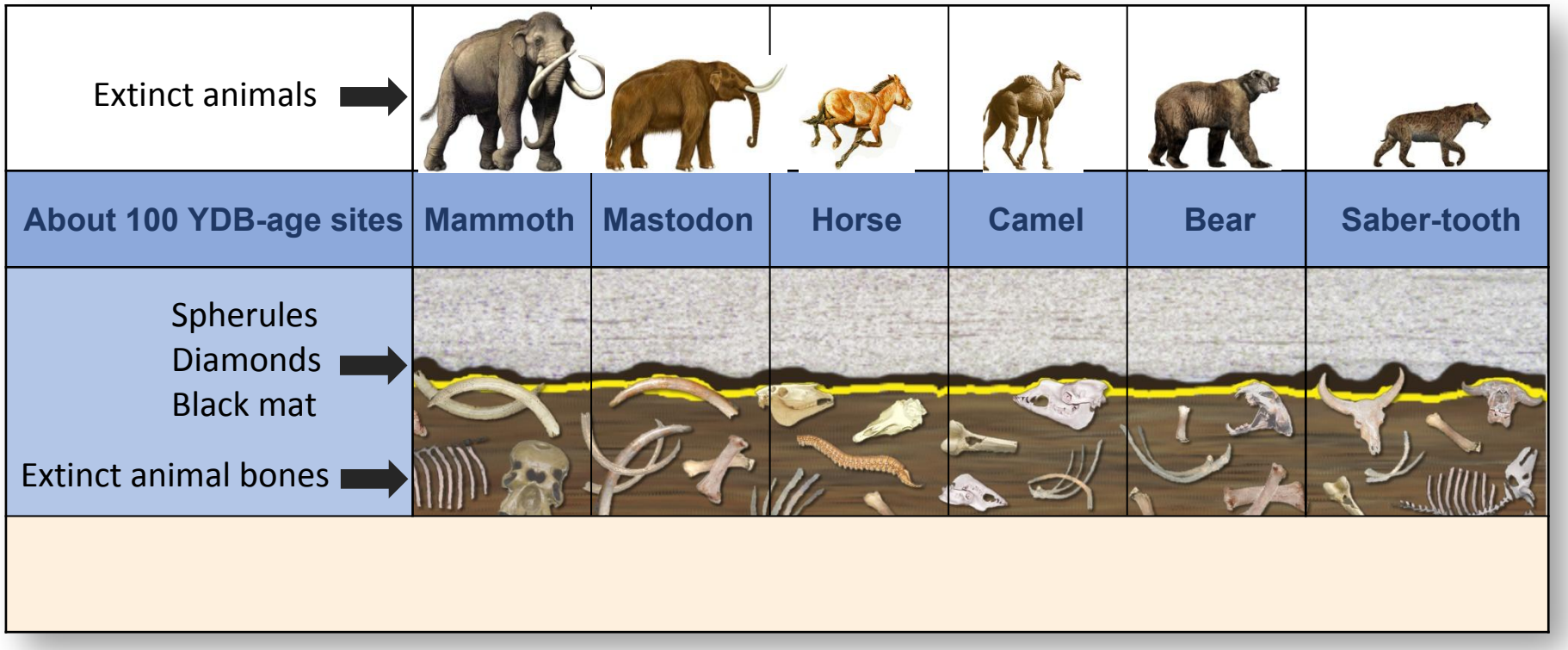


Problems with Overkill

There were only an estimated few tens of thousands of people in North America 12,800 years ago. Could so few kill so many? Not likely. Especially since, wolves, vultures, lions, mice, prairie dogs, bats, and moles went extinct, too. There is simply no evidence people were killing or eating those species.

Also, humans had been in Asia and Europe for hundreds of thousands of years. Those animals would have had no fear either when man arrived. And yet, they co-existed with man for millennia until they went extinct around the same time as in North America.

Extinction, Black Mats, and YDB Impact



Of about 100 sites studied, the bones of extinct animals have never been found above the black mat, containing nanodiamonds and spherules

Artist's concept of what the YDB impact may have looked like to mammoths

Explosion Credit: USACE.ARMY
Mammoth Credit: Restavr, Dreamstime.com

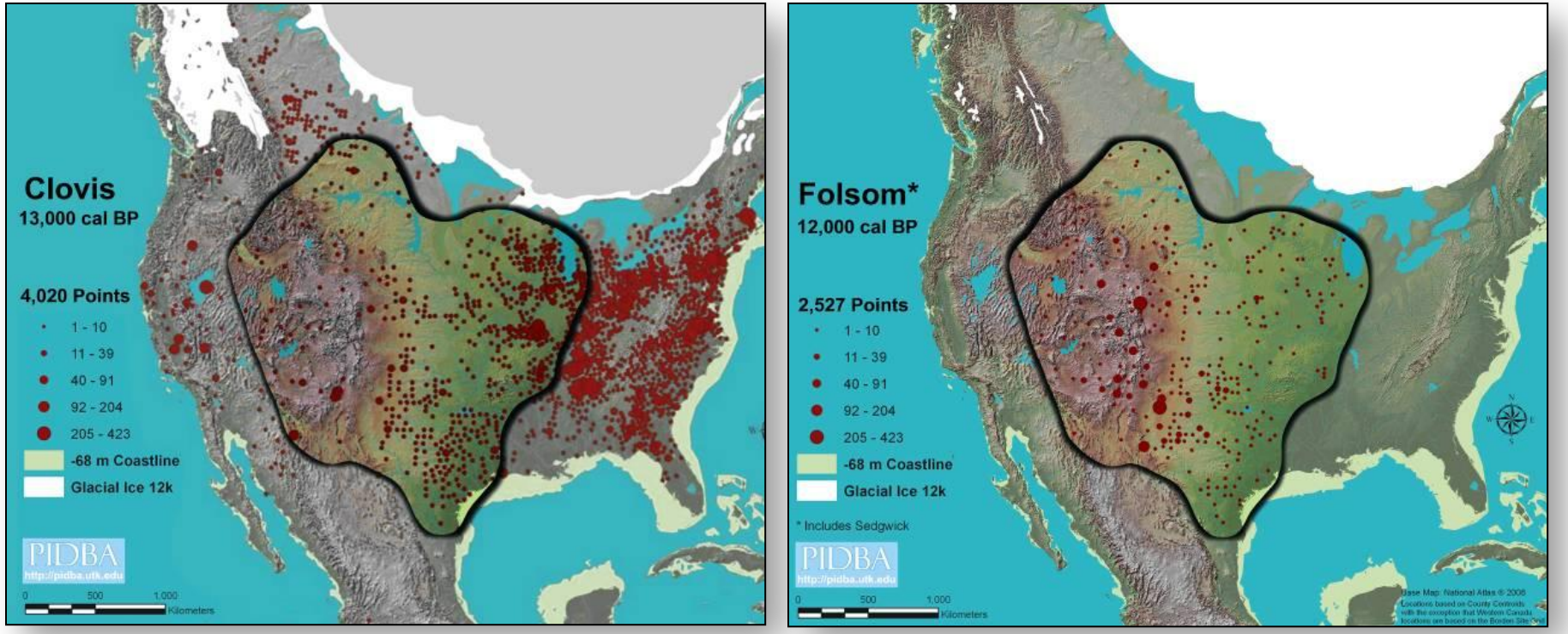
Human Population Decline

There is no way to know exactly how many people were in North America 12,800 years ago, but it was probably only a few tens of thousands. Scientists estimate population size using flint tools, which survive for a long time. If there are, for example, 10,000 known flint tools of a particular age and 5,000 tools only a few centuries later, then it is likely that there only half as many people.

That is exactly the situation for Clovis points 12,800 years ago versus post-Clovis point numbers. A drastic decrease in the numbers of post-Clovis flint tools suggests a major 30% to 60% decline in the number of people living in North America after the YDB impact. Similar population declines occurred across the Northern Hemisphere in Europe and Asia.

Imagine what would happen if 50% of the people around you suddenly died.

YDB Population Decline

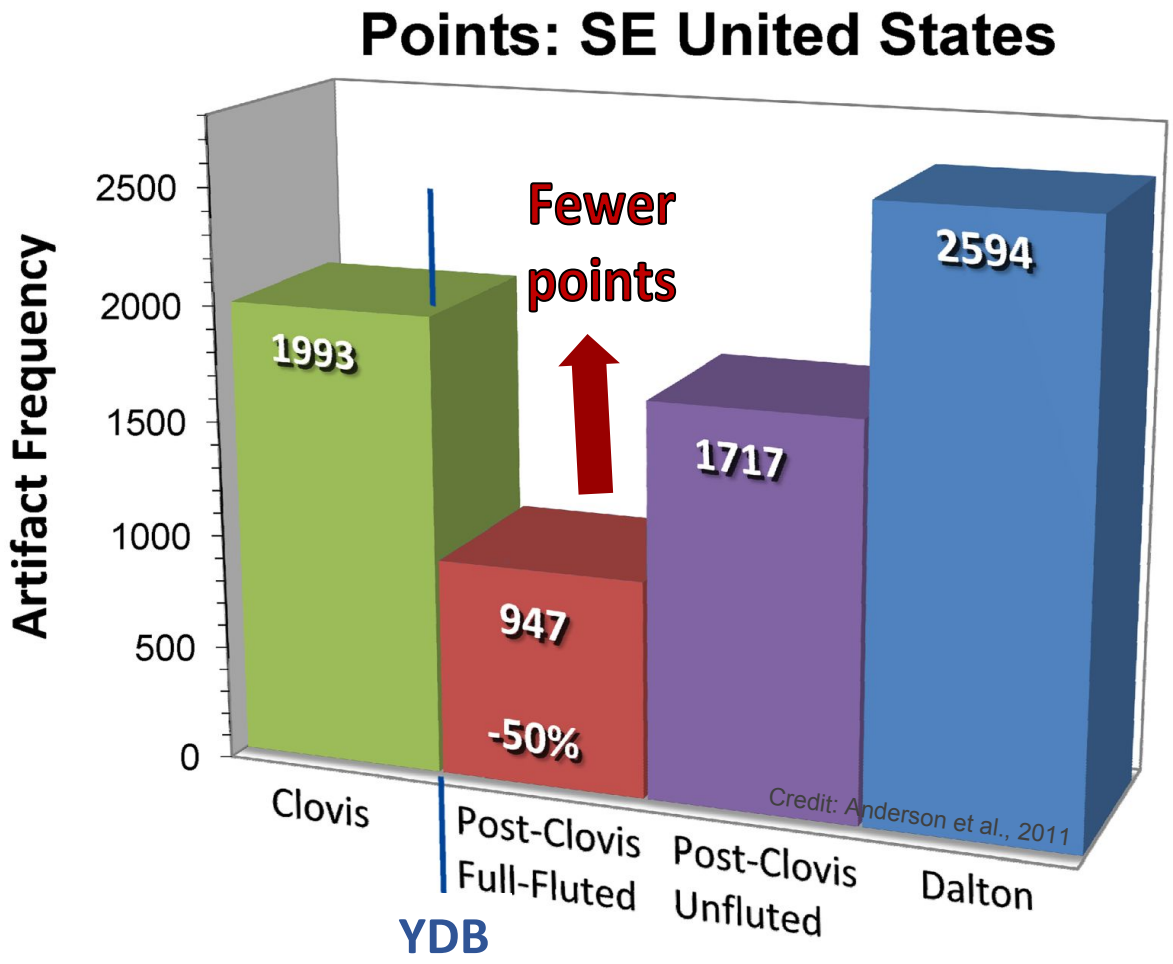


Credit: Anderson et al., 2011

At left are the number of Clovis points (red dots) on the Great Plains (enclosed by black line) that date to around 12,800 years ago.

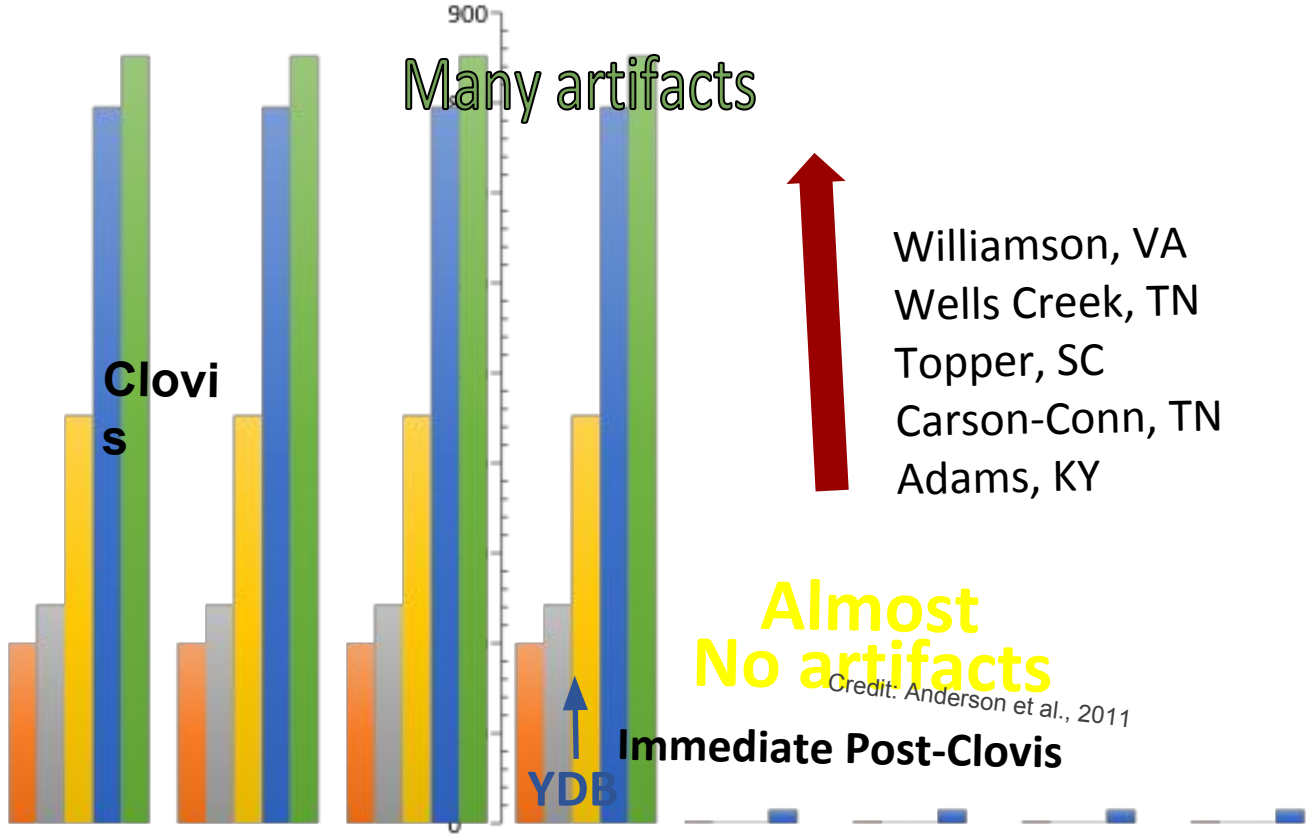
At right, covering the same area, are the number of post-Clovis points (Folsom), which are considerably lower in number.

More red dots for projectile points indicate that more people were around before the YDB impact.



Decline in # of post-Clovis projectile points after 12.8 ka

Clovis point counts for the Southeastern United States show nearly 2000 known points. The number drops to less than 1000 after the impact, suggesting that there were about 50% fewer people around.



Clovis quarries were nearly abandoned after 12,800 years ago

Up until 12,800 years ago, Clovis people mined their flint from quarries. Then, suddenly quarry usage nearly completely stopped. The number of artifacts found in 13 quarries in the Southeastern United States drops to nearly zero (5 quarries shown in image), indicating that the number of people still around after the impact was far less than 50%.