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Buried for 23,000 years: These footprints are rewriting American history

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Source: University of Arizona

Summary: Footprints found in the ancient lakebeds of White Sands may prove that humans lived in North America 23,000 years ago — much earlier than previously believed. A new study using radiocarbon-dated mud bolsters earlier findings, making it the third line of evidence pointing to this revised timeline.

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Human footprints at White Sands National Park in New Mexico, reported in 2021, show that human activity occurred in the Americas as long as 23,000 years ago – about 10,000 years earlier than previously thought. A new

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U of A study supports the 2021 findings. Credit: Courtesy of David Bustos/White Sands National Park

Vance Holliday jumped at the invitation to go do geology at New Mexico's White Sands. The landscape, just west of Alamogordo, looks surreal - endless, rolling dunes of fine beige gypsum, left behind by ancient seas. It's one of the most unique geologic features in the world.

But a national park protects much of the area's natural resources, and the U.S. Army uses an adjacent swath as a missile range, making research at White Sands impossible much of the time. So it was an easy call for Holliday, a University of Arizona archaeologist and geologist, to accept an invitation in 2012 to do research in the park. While he was there, he asked, skeptically, if he could look at a site on the missile range.

"Well, next thing I know, there we were on the missile range," he said.

Holliday and a graduate student spent several days examining geologic layers in trenches, dug by previous researchers, to piece together a timeline for the area. They had no idea that, about 100 yards away, were footprints, preserved in ancient clay and buried under gypsum, that would help spark a wholly new theory about when humans arrived in the Americas.

Researchers from Bournemouth University in the United Kingdom and the U.S. National Park Service excavated those footprints in 2019 and published their paper in 2021. Holliday did not participate in the excavation but became a co-author after some of his 2012 data helped date the footprints.

The tracks showed human activity in the area occurred between 23,000 and 21,000 years ago - a timeline that would upend anthropologists' understanding of when cultures developed in North America. It would make the prints about 10,000 years older than remains found 90 years ago at a site near Clovis, New Mexico, which gave its name to an artifact assemblage long understood by archaeologists to represent the earliest known culture in North America. Critics have spent the last four years

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questioning the 2021 findings, largely arguing that the ancient seeds and pollen in the soil used to date the footprints were unreliable markers.

Now, Holliday leads a new study that supports the 2021 findings - this time relying on ancient mud to radiocarbon date the footprints, not seeds and pollen, and an independent lab to make the analysis. The paper was published today in the journal *Science Advances*.

Specifically, the new paper finds that the mud is between 20,700 and 22,400 years old - which correlates with the original finding that the footprints are between 21,000 and 23,000 years old. The new study now marks the third type of material - mud in addition to seeds and pollen - used to date the footprints, and by three different labs. Two separate research groups now have a total of 55 consistent radiocarbon dates.

"It's a remarkably consistent record," said Holliday, a professor emeritus in the School of Anthropology and Department of Geosciences who has studied the "peopling of the Americas" for nearly 50 years, focusing largely on the Great Plains and the Southwest.

"You get to the point where it's really hard to explain all this away," he added. "As I say in the paper, it would be serendipity in the extreme to have all these dates giving you a consistent picture that's in error."

Millennia ago, White Sands was a series of lakes that eventually dried up. Wind erosion piled the gypsum into the dunes that define the area today. The footprints were excavated in the beds of a stream that flowed into one such ancient lake.

"The wind erosion destroyed part of the story, so that part is just gone," Holliday said. "The rest is buried under the world's biggest pile of gypsum sand."

For the latest study, Holliday and Jason Windingstad, a doctoral candidate in environmental science, returned to White Sands in 2022 and 2023 and dug a new series of trenches for a closer look at the geology of the lake beds. Windingstad had worked at White Sands as a consulting geoarchaeologist for other research teams when he agreed to join Holliday's study.

"It's a strange feeling when you go out there and look at the footprints and see them in person," Windingstad said. "You realize that it basically contradicts everything that you've been taught about the peopling of North America."

Holliday acknowledges that the new study doesn't address a question he's heard from critics since 2021: Why are there no signs of artifacts or settlements left behind by those who made the footprints?

It's a fair question, Holliday and Windingstad said, and Holliday still does not have a peer-reviewed answer. Some of the footprints uncovered for the 2021 study were part of trackways that would have taken just a few seconds to walk, Holliday estimates. It's perfectly reasonable, he said, to assume that hunter-gatherers would be careful not to leave behind any resources in such a short time frame.

"These people live by their artifacts, and they were far away from where they can get replacement material. They're not just randomly dropping artifacts," he said. "It's not logical to me that you're going to see a debris field."

Even though he was confident in the 2021 findings to begin with, Holliday said, he's glad to have more data to support them.

"I really had no doubt from the outset because the dating we had was already consistent," Holliday said. "We have direct data from the field - and a lot of it now."

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Journal Reference:

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