

OF PREHISTORIC PROPORTIONS

When Willis Evans first spotted a hole in a limestone cliff above Lake Mead, he had no idea that it preserved “one of the world’s richest known sources of fossils and other evidence of life in the ice age.” Among other paleontological treasures, the cave held the skulls, claws and shaggy hair of giant ground sloths, extinct mammals the size of a large black bear.

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Sometimes a cave is just a cave, but sometimes it's a time capsule containing prehistoric wonders. Willis Evans, a Pit River Indian working at Lake Mead for the National Park Service in 1936, knew this. Evans had years of experience working on archaeological digs in the Southwest, uncovering ancient artifacts in dark and strange places.

So, when he spied a hole in a limestone cliff high above Lake Mead at the western end of the Grand Canyon, he seized his first opportunity to explore it, although it wasn't easy to get there. The hole was almost 700 feet above the lake, up a sheer cliff with rockslides. Plus, the scorching summer sun was nearly intolerable. Evans, though, was too curious to back down.

What seemed from below to be a little pocket in the Muav limestone was indeed a large cavern with an entrance about 20 feet wide and 12 feet high. To say it was well worth investigating is an understatement. Author James E. Kinter, in a November 1938 *Arizona Highways* story, called the cave "one of the greatest natural history books Nature ever conceived," adding that finding it "took an Indian with the courage born of centuries of facing danger, with the surefootedness of a mountain sheep, and the keen eye of an eagle."

In the cave, Evans found himself in deep dung. Literally. According to a story by Russell K. Grater in the July 1958 issue of *Arizona Highways*, the cave floor looked to Evans like an "old deserted horse stable with droppings strewn around in large quantities." Even in the dim light, Evans recognized the dung as belonging to extinct Shasta ground sloths, animals the size of hefty black bears but much slower. He was familiar with ground-sloth droppings from excavating Gypsum Cave in Nevada with archaeologist Mark R. Harrington in the early 1930s. In addition to the sloth dung, the cave was filled with fossilized pack-rat middens — piles of the rats' dung and other refuse.

Evans had stumbled upon paleontological gold. The dung, well preserved by the cave and the arid climate, could be used to learn a lot about the sloths, including their diet, which in turn could be used to learn about the local environment thousands of years ago. Pack-rat middens could also be analyzed in this way. As paleoecologist Paul S. Martin explained in his 2007 book *Twilight of the Mammoths*, "the diets of extinct animals are impossible to determine in any detail from fossil bones. Unmineralized dung deposits are ideal but so unusual that most paleontologists never see them."

Evans and the Park Service immediately put together a team to excavate the newly named Rampart Cave. They dug two test pits in the back of the cavern, where they thought they'd uncover the best samples. In research-

ing his *Arizona Highways* story, Kinter inspected Rampart Cave after the pits were dug. He said the team had drilled 8 feet through stratified pack-rat middens and Shasta-sloth dung but still hadn't reached the cavern floor. Grater wrote that the layers of dung, alternating with layers of dust from when the cave was unoccupied, were 20 feet deep in some places.

"From the actual dig," Kinter said, "had been taken three skulls of the sloth, long curved claws, bits of thick hide with shaggy hair still clinging to them, and along with this find were the practically complete skeletons of two animals." Plus, they unearthed the remains of several other creatures, including an extinct mountain goat, a gopher tortoise, California condors, a jackrabbit, an extinct burro-size horse, a yellow-bellied marmot and a ringtail. No relics signifying human habitation were found.

From this collection of Shasta-sloth bones, tissue and dung, scientists were able to form a much better picture of what the creatures were like. Though these sloths, known scientifically as *Nothotheriops shastensis*, were among the smallest ground sloths, they were still up to 9 feet long, from head to tail, and weighing up to 550 pounds, the same weight as a large black bear. And they scratched themselves like great big bears — parts of the cave walls were polished from sloths rubbing up against them with their long, reddish fur.

Sloths most likely waddled as they walked because of the shape of their feet, at rates averaging 1 or 2 miles a day. They possessed long, sharp claws, curved like cow horns, which the herbivores used to rip apart desert scrub and woodland shrubs for their food. The sharpness of their claws contrasted with the dullness of their teeth, and Shasta sloths lacked front choppers. They likely sat on their huge haunches as they ate.

Analyses of sloth dung from Rampart Cave show that the animals consumed an abundance of globemallows. A huge amount of juniper pollen was also found in their droppings, but because the trees are wind pollinated, it could be that the pollen was simply blown onto other plants that the sloths ate. However, "the presence of so much juniper pollen indicated the presence of junipers themselves and a change in climate over the last 30,000

years," Martin wrote in *Twilight of the Mammoths*.

In the late 1950s, Martin was studying Rampart Cave droppings with two University of Arizona graduate students, Dick Shutler and Bruno Sabels. The samples they were analyzing had been collected by Shutler himself. Using radiocarbon dating, a revolutionary technique developed by Willard F. Libby in the 1940s, Shutler found that the last sloths lived in the cave 10,000 radiocarbon years ago (which would be about 12,000 calendar years ago). However, radiocarbon dating in its earliest days wasn't as accurate as it became later.

Thus, in 1969, Martin decided to study the dung again to get more precise results. Guided by the Park Service, which had installed a heavy iron gate with a padlock at the entrance of Rampart Cave to deter vandals, he finally entered the cave himself after 11 years of studying samples gathered by other people. "One did not need to be a Sufi or a mystic to sense that this dimly lit, low-ceilinged chamber was a sacred sanctuary," Martin said of his visit. "More than a sepulcher for the dead, Rampart Cave venerated the extinct."

Martin collected untrampled dung balls the size of baseballs, the youngest to be deposited, as well as compacted dung from the lowest layer. After analyzing these new samples and those previously collected, he found that the first Shasta sloths entered Rampart Cave more than 40,000 radiocarbon years (or 45,000 calendar years) ago. They all died out between 10,000 and 11,000 radiocarbon years (or between 12,000 and 13,000 calendar years) ago — throughout their known range, not just in Rampart Cave.

Giant ground sloths evolved in South America, then migrated to North America 8 million years ago. The Shasta species lived in the western United States and Mexico. Besides Rampart Cave, their remains have been found in other places in Arizona: Muav Caves, Ventana Cave and Kartchner Caverns. But Rampart Cave



contained the biggest, most complete and best-preserved remains.

With the improved radiocarbon dates, Martin determined that Shasta sloths were alive at the same time that one of America's

first cultures, the Clovis people,

swept across the country starting 13,000 years ago. Perhaps the slow sloths — "ambulatory pincushions," as Martin described them — were the targets of those people's sharp spears. Shasta ground sloths lived in the Pleistocene Epoch, known as the Great Ice Age, which existed more or less between 1.8 million and 10,000 years ago. By the end of this epoch, all of the ground sloths and many other large mammals of the Americas, such as woolly mammoths and saber-toothed cats, had died out. The Shasta sloth is survived by a few relatives bizarre in their own right, including tree sloths, anteaters and armadillos, none of which live in Arizona, outside of a zoo.

Unfortunately, Rampart Cave is now extinct, too — in a figurative sense. The iron gate the Park Service installed to protect it wasn't enough to keep people out, and in July 1976, vandals bent the gate and set fire to the deposit. All smoke and no flames, the fire smoldered for months. Most of the deposit was turned to ash. In a 1977 *New York Times* article, Boyce Rensberger lamented that the fire burned up "one of the world's richest known sources of fossils and other evidence of life in the ice age."

Even after his intensive sloth studies, Martin regretted not excavating even more samples from Rampart Cave before it was too late. "In its own way," he said, "the Rampart Cave fire was as destructive of information as the long-lamented conflagration of the ancient library in Alexandria, Egypt."

Perhaps, though, there is another cave with another incredible fossil record yet to be discovered somewhere in the vast wilderness of Arizona. Scientists are tirelessly uncovering evidence of what Earth was like before we humans even existed. Quite possibly, even stranger animals than giant ground sloths — which Kinter aptly called "Arizona's desert bear" — once plodded through this great state and we just don't know it yet. **AH**