

# Moon tourism on the move

California's catalog of historic artifacts includes two pairs of boots, an American flag, empty food bags, a pair of tongs and more than a hundred other items left behind at a place called Tranquillity Base. The history registry for New Mexico lists the same items. That might be surprising, since Tranquillity Base is not in New Mexico or California but a quarter of a million miles away, in the spot where Neil A. Armstrong and Buzz Aldrin stepped onto the moon in 1969.

But for archaeologists and historians worried that the next generation of people visiting the moon might carelessly obliterate the site of one of humanity's greatest accomplishments, these designations were important first steps toward raising awareness of the need to protect off-world artifacts. "I think it's humanity's heritage," said Beth L. O'Leary, a professor of anthropology at New Mexico State University. "It's just an incredible realm that archaeologists haven't begun to look at until now."

Dr. O'Leary herself had not given much thought to historic preservation on the Moon until a student asked her in 1999 whether federal preservation laws applied to the Apollo landing sites. "That started the ball rolling," she said. It turned out to be a tricky question. Under international law, the United States government still owns everything it left on the moon: the bottom half of the first lunar lander, the scientific experiments, the urine bags. But 100 nations, including the United States, have signed the Outer Space Treaty, in which they agree not to claim sovereignty over any part of the moon.

For most of the last decade, the effort by Dr. O'Leary and her students to seek formal protection for the Apollo sites was a lonely pursuit. NASA, by its nature, looks more to its future than its past. "There's a tendency of NASA, when their programs end, they tend to get rid of everything," said Milford Wayne Donaldson, the historic preservation officer for California.

Federal officials were also wary that other countries would see granting historic protection to the Apollo sites as a ruse by the United States to put down territorial claims. And with no plans to go back to the moon, it all seemed like an academic exercise.

But interest in the moon has perked up again. Russia and India plan to send robotic landers. NASA was going to send astronauts back there until the Obama

administration changed course a couple of years ago. Most crucially, the Google Lunar X Prize, a competition among 26 teams to become the first private organization to put a spacecraft on the moon, offered a \$1 million bonus for visiting a historic site there. At least one team announced it was heading for Tranquillity Base. Suddenly, the prospect of a new little rover's rolling over Neil Armstrong's footprints was not entirely farfetched.

So Dr. O'Leary started placing calls to historic preservation officials in states where the space industry looms large. Texas, she learned, couldn't help her, because to be listed as a historic resource there, an item must lie in Texas. In early 2009, she called Mr. Donaldson in Sacramento to recruit his help in protecting American relics on the moon, "which I thought was an incredible, great idea right off the bat," he said. Dr. O'Leary and her students had already tried to get the National Park Service to list the base as a national historic landmark, but "they had been turned down flatly," Mr. Donaldson said.

When he checked California's laws, he found that artifacts just had to have an association with the state to be listed. The Apollo program qualified, and the Historical Resources Commission approved the listing in January 2010. New Mexico followed three months later. NASA became interested, too. Robert Kelso, manager of lunar commercial services at NASA's Johnson Space Center in Houston, said he had talked with top officials at the agency: "We said if they're serious about going, we ought to get some of our best and brightest together and begin looking at this."

NASA held a workshop a year ago about the preservation issue. Then Mr. Kelso led a team that cataloged what was left on the moon after the six Apollo landings, and it recommended how to balance historic preservation with the likely desire in the future to investigate how well the materials have lasted. The recommendations, issued in the fall, place greater protections on items from the first moon mission, Apollo 11, and the last one, Apollo 17. For Apollo 11, the recommendations ask that any visitor, robotic or human, stay at least 75 meters from the lander.

"In that case, it would protect every footprint from Neil and Buzz and all the flight hardware," Mr. Kelso said. For Apollo 17, the protection bubble is even wider — 225 meters — because a lunar buggy let the last two men on the moon, Eugene A. Cernan and Harrison H. Schmitt, cover much more ground. "We didn't protect every rover track and footprint," Mr. Kelso said, "but we protected a lot of them." The recommendation for the other landing sites is that visitors can get close but not touch anything.

Mr. Kelso's team also suggested guidelines for the paths of spacecraft overhead, to limit the chance that rocket exhaust will blow around lunar dust and damage the footprints. Mr. Kelso said NASA's recommendations, like the listings by California and New Mexico, have no legal force. "We are hoping that whether it's an international team or a commercial team, they would honor and recognize the value of these sites and honor these recommendations," he said. That may be enough.

"It's a sea change for NASA to come out with recommendations," Dr. O'Leary said. "I think that the guidance you provide certainly strengthens the moral sanctions against obliterating some part of the archaeological record." The Lunar X Prize team that declared that it was going to Tranquillity Base, run by a company called Astrobotic Technology, now says it will stay away from the Apollo 11 and 17 sites.

Mr. Donaldson would like to add Tranquillity Base to the United Nations' list of world heritage sites. But first he will have to get the rules changed. Currently, nations can nominate only sites that are "on their territory." (NYT 9-1-12).