Global warming threatens to destroy our heritage

Andrew Curry 02/06/2009

Global warming is not simply a present danger, but one that threatens also to wipe away our past. Andrew Curry examines the historic sites at risk from the elements

Rising sea levels are eating away at coastal sites; increased rainfall is eroding mudbrick ruins; creeping desert sands are blasting the traces of ancient civilisations, and the melting of ice is causing millennia-old organic remains to rot.

For countless communities, archaeology can be a source of local identity, pride and income. 'It may be intangible, but when a community loses its connection to history it loses something pretty important,' says University of Northern Colorado anthropologist Michael Kimball.

Archaeologists can't stop global warming, but they can make dealing with it a priority. That may mean documenting sites before they disappear; in some places, simple steps such as putting roofs over melting or rain-threatened areas are ways to preserve them. Action, however, must be taken soon. What follows is a look at some of the threats facing archaeological sites around the world.

Thawing Scythian tombs

Three thousand years ago, Scythian nomads ruled the Eurasian steppes from the edges of the Black Sea in the west to China in the east. In the Scythian burial mounds in the Altai mountains on the edge of the vast Siberian permafrost region, archaeologists have found amazingly well-preserved mummies in the tombs, often with their clothing, burial goods, horses and even stomach contents intact. 'Instead of archaeology, the material culture is so well preserved it's almost a kind of ethnography,' says Hermann Parzinger, who discovered the tomb of a mummified Scythian warrior in Mongolia in 2006.

Scientists say the Altai mountains aren't as cold as they used to be, however. The glaciers that covered the slopes of the Altai are receding and even disappearing, and for the first time since their occupants were buried 3,000 years ago, the Scythian tombs are in danger of thawing out and rotting away.

'These tombs are all in an area where the permafrost is just at an equilibrium,' says Jean Bourgeois, an archaeologist at Ghent University who works on sites in Russia and Kazakhstan. 'Just a degree or two can be enough to [destroy] frozen contents.'

Archaeologists are scrambling to figure out how to keep the grave mounds cool. Proposals range from reflecting sunlight away from the kurgans by painting them white to stabilising the underground temperature by installing 'thermo-pumps'. After seeing the region's climate change with his own eyes over the past decade,
however, Bourgeois has come to realise that even in a best-case scenario, archaeologists cannot preserve all of them. 'They will have to choose,' he says.

Channel Islands erosion

The Channel Islands off the coast of California are a critical link in the study of how humans settled the Americas. Many researchers now believe that the first people came to America by boat, island-hopping from Siberia all the way down to the California coast.

Some of the best evidence for this comes from the Channel Islands. Evidence from shell middens, rock shelters and other settlement sites supports the idea that early Americans were good sailors who reached the islands more than 13,000 years ago, hunting pygmy mammoths, elephant seals and sea lions. Human bones found on Santa Rosa Island in 1959 have been radiocarbon-dated to 13,000 years ago, making them the oldest human bones found in the Americas.

Rising seas now threaten to wipe out clues to how early humans made their way into the Americas, just as researchers are beginning to look into the possibility of coastal migration. At Daisy Cave on San Miguel Island, University of Oregon archaeologist Jon Erlandson has spent a decade excavating a 65ft-wide midden that the island's prehistoric residents built up over thousands of years. Excavators have found the remains of tools, beads and even baskets.

Their work is becoming a race against time, however. Erlandson says the midden has shrunk by approximately 3ft in the past decade. 'If we've lost a metre in 10 years, how much will we lose in 50 or 100?' he asks.

The desertification of Sudan

Local nomads call the ruins *Musawwarat es-Sufra*, or 'yellow pictures'. More than 2,000 years ago, the kings of the Meroites – a desert kingdom closely linked to ancient Egypt –built a temple complex 20 miles east of the Nile valley, in what is today Sudan. 'It was probably the most important pilgrimage site of the Meroitic kingdom,' says Claudia Naeser, an archaeologist at Berlin's Humboldt University, who is excavating its reservoirs and temples.

Musawwarat's centerpiece was the 50ft long Temple of the Lion God, carved inside and out with reliefs dedicated to the Meroitic god of fertility, Apedemak. The lion god's temple was once in the middle of a grassland, but warming temperatures and overuse have killed off the area's vegetation, and the Sahara's sands are creeping ever closer.

Musawwarat is far from alone. The scale of the problem is overwhelming, and solutions – from hardening stone with special chemicals to erecting protective walls or planting trees as windbreaks – either prohibitively expensive or impossible because of a lack of water. There may soon be no more 'yellow pictures' to see.

Retreating Swiss glaciers

In the summer of 2004, University of Bern archaeologist Albert Hafner led an expedition high into the Swiss Alps to investigate hiker Ursula Leuenberger's discovery of a 4,000- year-old leather quiver the previous summer. At the site, near the Schnidejoch glacier, they found a 5ft-thick ice patch, 260ft long and 100ft wide. In just one sunny week, the edges of the ice patch shrank 20ft. Over the course of two summers, archaeologists found in it everything from prehistoric leather pants and shoes to nails from Roman sandals.

The finds revealed that people have climbed high in the Alps for millennia, despite the harsh conditions. 'This was just the quickest way from one valley to another,' says Hafner.

His work also showed that 1,000-year gaps in the ages of the artefacts corresponded with cold periods when glacial ice would have blocked the pass. The fact that fragile organic materials have been preserved near Schnidejoch for more than 5,000 years means that the ice cover in that area hasn't been this small since the Stone Age.

For archaeologists, the melting ice is both a crisis and an opportunity: the artefacts at Schnidejoch never would have been found without climate change, but as alpine ice fields thaw and vanish, countless more artefacts may rot away and disappear forever.

Rainstorms in Peru

In Peru, the difference between a normal and a bad El Niño year can be tremendous. The country's deserts typically get slightly more than an inch of rain per year. In 1998, the last severe El Niño season, the region was doused with 120 inches, which caused serious flooding. Water takes a heavy toll on exposed archaeological sites, many of which are located along rivers or on easily eroded slopes.

Take Chan Chan, an elaborately planned city eight miles square that dates back 1,000 years. Made of unfired mud brick, Chan Chan's pyramids and palaces were put on UNESCO's list of World Heritage Sites in Danger in 1986 because they were threatened by erosion. Over the past two decades, the site has deteriorated steadily.

Greenland's melting sea ice

In a normal summer, Greenland's northern and eastern coasts should be ringed by an ice belt 30 to 40 miles wide. The drifting ice acts like a shock absorber, dampening the strength of the North Atlantic, but in the past five years, the sea ice has all but disappeared. Without its floating frozen shield, Greenland's coast is being pummelled by storm surges originating hundreds of miles away.

The effect on the island's heritage has been catastrophic. Hardest hit have been sites associated with the Thule culture, people closely related to the Inuit of northern Canada who migrated to Greenland some 2,000 years ago. Thule houses – made of stone and turf with whale-bone rafters – are disappearing quickly, along with buried tools and artefacts.

'A metre per season will be tumbled down to the beach and washed away,' says Danish archaeologist Bjarne Grønnow. 'It is not a slow process.' Older sites along the coast are also in danger. Archaeologists fear the frozen turf that covers Qeqertasussuk, a 4,500-year-old settlement where evidence for the earliest settlement of Greenland was found, may be melting. Grønnow is heading there this summer, and he is not optimistic.

'I've been working in Greenland for 30 years now,' he says. 'I can see with my own eyes how it has changed.'

Andrew Curry is a contributing editor to *Archaeology* magazine

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