Archaeological Heritage Management, Climate Change and World Heritage in the 21st Century

Archaeologists are confronted every moment of their working lives with the impacts of climate change over the past millennia. With differing levels of intensity and duration, the climate of the earth has always been changing and offering challenges to human society. When archaeologists or prehistorians conceptualize past societies, they cannot ignore environmental and climatic settings. And when they view descendent communities, again they cannot help but consider the impact of environmental change on the lifestyles of peoples who live close to nature. Changes in climate have altered the shapes of continents, induced human speciation, spurred on technological change, and caused adaptations and accommodations in human behavior and social institutions. Change demanded by radical fluctuations in climate has shaped environments and in turn has punctuated human evolutionary history (Eldredge and Gould 1972). Humans have sought spiritual guidance, developed technologies and have altered social systems to cope with the impacts of climate change on their environments. Some of those adaptations have been relatively successful and others have been dismal failures (Diamond 2005). Stress on environmental resources is of major importance. There is no doubt that an overriding factor in dealing with climate change is the interplay between the cultural and natural realms in providing the framework for the choices and responses that societies make when confronted with constraints resulting from competition for resources.

Climate change has made us what we are! What we will be depends upon the choices that we make!

Although politicians and scientists may argue over the root-causes of global warming, there is no doubt that it is taking place and will continue to do so (Chapman 2002: 241). The natural heritage world has an ongoing interest in climate and its impact on flora and faunal biodiversity, and on landforms. Information is available, for instance, on the impacts on alpine fauna of receding snowlines, bleaching of coral reefs and on increased dangers from wild fires (UNESCO World Heritage Centre 2007: 168-191). Cultural heritage specialists have only recently offered viewpoints of likely impacts, with those provided for the built environment (Cassar 2005) being more specific than those offered for archaeological remains (Pearson 2006).

The best point of departure for a consideration of the impact of climate change on heritage management, although it does not deal explicitly with archaeological remains, is the work of the University College of London, Centre for Sustainable Heritage that was sponsored in 2002 by English Heritage. *Climate Change and the Historic Environment* by May Cassar offers a thoughtful consideration of the measures that need to be taken to ameliorate the impacts of climate change on heritage resources (refer also to Cassar and Pender 2005; and, UNESCO World Heritage Centre 2006b). Climate change will highlight long standing conservation issues and actions to monitor and undertake timely maintenance will be essential. Cassar asserts that difficult decisions will need to be made as to which properties can be preserved and that emergency preparedness will be essential.

Fluctuations in water levels can be devastating to all manner of heritage resources. Changes in the moisture regimes of soils will adversely impact the preservation of organic archaeological materials. Marked seasonal fluctuations, increases in annual temperatures and greater fluctuations in diurnal temperatures will weaken ancient building materials. Gradual processes of deterioration will increase in magnitude if climate change accelerates, and little-to-no time may be available to prepare for sudden and devastating events. The Mississippi Heritage Trust reports that: 'the historic buildings on the coast have suffered extreme damage and in some cases blocks of buildings in historic districts have been wiped clean by Katrina's storm surge!' Impacts on populations that are supported by heritage places are poorly understood, but expanding on the example of the impact of Katrina on New Orleans, it is quite likely we will see an increase in looting as law-enforcement systems become strained coping with natural disasters. The Trust's web-site lists scores of heritage buildings that have been awarded funds under the Hurricane Relief Grant Program. Although there is no direct linkage between climate change and the incidences and severity of hurricanes, Katrina did catastrophic damage to the tourism industry of New Orleans and could well be an exemplar of the likely impacts on coastal World Heritage places and on the communities that are dependent on those places for their economic support.

One of the most dramatic predictions is based on a case study of the World Heritage listed Palace of Westminster and Tower of London. Although these two places are not listed for their archaeological value, no doubt there would be a negative flow-on effect for the management of the archaeological heritage should the worst case scenario eventuate: for the Thames Barriers to become overwhelmed by tidal floodwaters. Prior to the construction of these barriers, it was anticipated that they would be used two to three times a year but, following their initial use in February of 1983, they are now being used six to seven times a year (UNESCO World Heritage Centre 2006a: Box 7). Just one overtopping of the barrier would severely impact the economy of the United Kingdom, causing a loss of £30 billion and catastrophic damage to the World Heritage properties.

Less easy to define in terms of an economic loss, archaeological resources will be impacted not only by climate change but by the measures that will be taken to mediate against severe events and the costs that will need to be paid to deal with the impact of major events on the built environment. Flooding and drainage efforts will be marked in coastal reaches. As engineering works are designed to drain low-lying areas or stabilize coastal reaches, these measures will impact known archaeological sites as well as archaeological resources yet to be discovered. In addition to coastal areas, archaeologists in general terms have considered likely impacts on wet-preserved inland sites with fragile organic remains (Chapman 2002) and on the erosion of coastal sites (Pearson and Williams 1996; Pearson 2006). However, there is a need for site-specific case studies reflecting current baseline conditions and predicted impacts.

Economic strictures will bring about competition for funds needed to mitigate the impacts of climate change. Also, the economics of climate change are such that, in the near future, it is highly unlikely that new funds will be generated to meet immediate needs by governments that are in denial of climate change. It is more than likely that funds allocated to other sectors of govern-

mental activities will be diverted as a band-aid to politically visible projects. For example, it is not altogether unimaginable that heritage managers could find that a portion of their annual budget will have been reallocated to subsidize more politically visible projects, such as alternative energy research and development. At best, heritage funds would remain steady through time instead of increasing to help heritage managers cope with the effects of climate change.

Maintenance and monitoring, and vulnerabilities and threats

Maintenance and monitoring, and identification of vulnerabilities and threats are seen as one of the more urgent responses to climate change with a need to commission baseline studies such that deterioration can be monitored (Cassar 2005: 1). At the present time, funding constraints are such that few monies will be available for field surveys, including baseline studies and condition assessments, long-term artifact curation, and site stabilization/conservation. Difficult decisions may have to be taken with regard to future inscriptions of World Heritage sites. For instance, should assessors factor in to their evaluations the likely impacts of climate change, much as they might do in some circumstances for the impacts of tourism, to the outstanding universal values of the place (Cassar and Pender 2005: 615; and, Labadi 2007: 187-190)?

Vulnerability assessments will need to involve stakeholder communities from the outset (UNESCO World Heritage Centre 2006a: Box 9). *World Heritage and Climate Change* (World Heritage Centre 2006a) offers succinct lists of 'Principal Climate Change Risks and Impacts on Cultural Heritage' and 'An Eight-Step Approach to Guide Vulnerability Assessments.'

One hundred and sixty two World Heritage sites are inscribed on the basis of their natural values. Some of these places are known to contain archaeological and historical resources. The World Heritage listing of the Willandra Lakes Region of New South Wales, Australia is designed to protect both natural heritage values as well as evidence of human occupation in the form of skeletal material and archaeological remains. Other World Heritage sites may contain yet undiscovered archaeological and historical resources of outstanding universal value. Kluane/Wrangell-St Elias/Glacial Bay/Tatshenshini-Alsek, of Alaska and British Columbia, is an example of a World Heritage site where significant archaeological remains may be revealed if the rate of snow-melt continues to expose previously unexposed land surfaces. The place is the ancestral homeland of the Champagne and Aishihik First Nations, and it is inscribed on the World Heritage list for its natural values (Criteria ii, iii and iv).

Concern has been expressed over the retreat of glaciers, flooding and erosion caused by increased melt water, and changes to alpine and near-alpine environmental regimes (UNESCO World Heritage Centre 2006a: sections 20-21). The Kluane/Wrangell-St Elias/Glacial Bay/Tatshenshini-Alsek case study addresses an issue that has yet to be discussed in the literature: the very likely possibility that places inscribed because of natural values may have to be re-evaluated to determine if climate change has caused hitherto unrecognized or unaddressed manifestations of cultural, social or historical value to emerge.

Ice Patches

An 'ice patch' is just that: a patch of ice at a relatively high altitude where caribou in the past have congregated to avoid biting insects and to escape the heat of summer. Thick scatters of dung inter-bedded with snow mark these places (Strand 2003). Herds of caribou made a tempting target for indigenous hunters; they were exploited in the distant prehistoric past and in more recent historic times. Colder times buried the ice patches under layers of snow. Warmer times have melted the permanent snow cover and revealed dung fields with scatters of artifacts employed by the ancestors of the First Nations to exploit the clusters of caribou (Dove *et al.* 2005). Thirty-five of the ice patches, some as close as 30 kilometers to the Kluane/Wrangell-St Elias/Glacial Bay/Tatshenshini-Alsek, have yielded organic remains spanning some 8,000 years (Farnell *et al*. 2004; Hare *et al.* 2004).

Dating to 8,300 years ago, the 'ice patch' archaeological remains represent some of the earliest organic materials found in prehistoric contexts in the Americas (Dove *et al*. 2005: 1). Wooden spear and arrow shafts are the most commonly encountered artifacts with a variety of other kinds of materials also being found. In addition, bone and dung specimens provide information on the prehistoric distribution of large species such as buffalo, mountain sheep and Wapiti as well as the diet of the caribou.

Around A.D. 700 there was a shift from hunting with spears or darts to the use of bows and arrows. This transition is abrupt and graphic, as long slender spears with large projectile points of flaked stone are replaced by shorter and lighter arrows with points made from deer antlers. 'Ice patch' data provide the best documentation in North America of the shift in hunting from spears to bows and arrows. Fragile high-altitude finds are subject to rapid deterioration once they are exposed to natural elements and organic materials must be recovered shortly after exposure by melting snow, if optimum (or any) preservation is sought.

Southern Yukon First Nations peoples are particularly concerned and directly involved with the recently revealed prehistoric cultural materials. Community leaders are actively working with archaeologists to recover artifacts and are using the opportunity presented by the archaeological finds for community-building. Elders are asked to recall their hunting lore and stories that have been handed down from the past to be recorded by community members. One of the most dramatic spin-offs of the community archaeological research are youth educational programs that feature week-long science camps and surveys of the 'ice patches.' A well-illustrated newsletter is a feature of the joint community and Parks Canada work (*Ice Patch* 2002 and 2005).

Overview

Melting of the snow cover of 'ice patches' and the subsequent exposure of fragile organic archaeological materials of considerable importance could become more widespread in alpine and near-alpine environments, as global climate change continues on the present warming trend. This 'ice patch' case study is offered as an exemplar of what should be monitored for in the neighboring World Heritage site of Kluane/Wrangell-St Elias/Glacial Bay/Tatshenshini-Alsek. Discussion of this case study is intended to

extend the present dialogue among archaeologists, inspire scientific research to predict and address impacts resulting from climate change, and to inform heritage managers of the kinds of changes they will need to deal with should the climate continue to change.

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