



The Frozen Past of Wrangell-St. Elias National Park and Preserve

By E. James Dixon, Craig M. Lee, William F. Manley, Ruth Ann Warden, and William D. Harrison



Photograph by of Robert Ivan

Figure 1. James Dixon and Craig Lee with an NPS helicopter conducting archeological survey on a glacier near Tanada Peak.

(Left) Researchers document an arrow exposed at the base of a steep ice patch.

Photograph by William Manley

As a result of climate change, rare archeological materials are melting from ancient glaciers around the world. Spectacular organic artifacts include prehistoric bows and arrows, spears, hunting tools, baskets, clothing, and even human remains. These unusual discoveries—preserved and frozen in ice for thousands of years—provide an unprecedented glimpse into the lives of ancient people and have captured public attention around the world. Discoveries in Wrangell St.-Elias National Park and Preserve (WRST) provide new insights into cultural development and highlight the exceptional craftsmanship and genius of early people in Alaska.

Alaska national parks are located in areas where glaciers are prominent, and are important regions for archeological and paleoecological research associated with climate change. Strong evidence of recent

warming in the Arctic includes historic records of increasing temperature, melting glaciers, reductions in the extent and thickness of sea ice, thawing permafrost, modified ecosystems, and rising sea level (ACIA 2005). These environmental changes are resulting in the emergence of artifacts from ancient ice. The discovery of ancient artifacts presents clear and compelling evidence that very old ice is melting, and Alaska's climate is changing.

Although some of these discoveries have been made on retreating glaciers (*Figure 1*), most have come from small features that Canadian scientists have termed “ice patches” (*Hare et al. 2004*). Ice patches frequently occur along the margins of high elevation plateaus and other large, relatively flat, treeless landforms (*Figure 2*). Most seem to be formed by drifting snow that accumulates to depths sufficient to persist through the entire summer, forming patterns that recur every year (*Holtmeier 2003*). Animal tracks and feces are commonly observed on their surfaces (*Figure 3*).

Ice patches are invisible in the winter when the entire landscape is covered by snow. However, in summer they become conspicuous, oasis-like features that attract caribou, sheep, and other animals that seek relief from heat and insects. In addition, the melting snow and ice on the surface produces a supply of fresh water. Accumulated feces and wind blown organic material enrich plant growth. The animals that use these microenvironments attracted ancient hunters who lost weapons, tools, clothing, and other possessions. These artifacts were buried by new snow that eventually became ice. Some ice patches have accumulated over millennia—layer upon layer of ice, artifacts, animal remains, and other fossils.

The exceptional preservation of organic artifacts found at these sites can make them appear to be recent, particularly to the untrained eye. As a result, their full significance may be overlooked. For this reason, it is important to date every specimen and not assume that specimens are recent, or that groups of objects found on the sur-



Photograph by William Manley

Figure 2. Recording organic materials melting from an ice patch.

face are contemporaneous. Once thawed, organic remains decompose or are subject to destruction by scavenging animals and soon disappear.

Ice patches are poorly known features of the cryosphere. Research in WRST is con-

tinuing with funding from the National Science Foundation, partnerships between scientists in Colorado and Alaska, and participation of the Ahtna Heritage Foundation. By incorporating traditional ecological knowledge of local residents, the function

of individual ice patches can be evaluated better. These observations can be correlated with physical data such as elevation, species distributions, local topography, radiocarbon dating, the types of artifacts found, and other information. This synergy

between local knowledge and scientific research greatly enhances understanding ice patches and their importance to people.

Ice patch archeology also presents unique challenges. Because it is not feasible or practical to dig test pits in ice, archeologists rely primarily on surface finds. Because artifacts are covered by accumulated snow for much of the year, archeological survey is limited to late summer within the ablation zone, the lower part of the ice patch where melting and evaporation of ice and snow exceeds winter accumulation. Ice patches exhibiting greater ablation than accumulation over the course of a year, or longer, present the best possibility for finding artifacts. Another challenge is the location of the ice patches, most of which are remote and not accessible by road. Field research requires complicated and expensive logistics, including helicopter support.

WRST is the most extensively glaciated area in the United States and its ice-covered portion encompasses 7726 mi² (20,100 km²) (*Post and Meier 1980*). Research funding and logistic support from the National Science Foundation's Office of Polar Programs facilitated the development of a Geographic Information System (GIS) model to guide archeological survey on ice patches and glaciers in WRST (*Dixon et al. 2005*). In the summer of 2001 and 2003, aircraft-supported pedestrian surveys were used to assess the archeological potential of the locales identified by the GIS model. The analysis and field survey demonstrated that most glaciers and ice patches do not contain archeological remains, and that there is an urgent need to develop scientific methods to identify specific glaciers and

ice patches that are most likely to contain frozen archeological remains.

The artifacts recovered from ice patches are unique and extremely important. Well-preserved organic remains are seldom preserved in archeological sites, particularly sites in Interior Alaska. Commonly, archeologists have only nonperishable remains, such as ceramics and stone, from which to interpret the past. Without the organic artifacts recovered from ice patches, there would be little evidence of the rich material culture essential for survival in these high latitude environments.

The 2001 and 2003 surveys resulted in the identification of five prehistoric sites that contained artifacts ranging in age from 370 to 2880 radiocarbon years before present (B.P.). Three of the five prehistoric sites were associated with ice patches and two

with cirque glaciers. All offered good hunting opportunities for caribou and sheep. The artifacts include several unilaterally barbed antler projectile points similar to specimens recovered from the Dixthada site in Interior Alaska (Rainey 1939) and from ice patches in the Yukon Territory (Hare et al. 2004). These arrowheads have conical bases for hafting in closed socket arrow shafts. Ownership marks (the “signature” of the individual who made or owned the arrow) are preserved on at least one arrowhead. One arrow was armed with a metal point manufactured from a native copper nugget (Figure 4) similar to other arrowheads reported from Interior Alaska and the Copper River region (Dixon 1985, Rainey 1939, Shinkwin 1979). The ends of at least two others exhibit green staining suggesting that they were also tipped with



Photograph by Craig Lee

Figure 3. Brian Clarke investigates a concentration of caribou dung at the base of a small ice patch.

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Photograph by William Manley

Figure 4. Projectile points made from copper nuggets were used to arm antler projectile points.



Photograph by William Manley

Figure 5. A recently exposed arrow shaft at the base of a melting ice patch.



Photograph by William Menley

Figure 6. Close-up of sinew lashing used to secure an antler projectile point to an arrow shaft.

copper end blades.

Wooden arrow shafts (*Figures 5-7*) have been radiocarbon dated to between 370 and 850 B.P. (before present). All of the wooden arrow shafts were exquisitely shaped from split wooden staves. Several exhibit traces of red and black pigment. Several preserve spiral impressions resulting from sinew lashing used to secure feathers (fletching) and points to the arrow shafts. At least one arrow was fletched with the feathers of a golden eagle. These types of arrows were used by Ahtna and Upper Tanana Athapaskan people hundreds of years later at the time of Euro-American contact in the 1800s, suggesting that they were left by their ancestors.

Atlatl darts (lightweight spears propelled

with the use of a spear thrower called an “atlatl”) are represented by what appear to be shaft fragments recovered from a cirque glacier. A possible atlatl dart (or spear) foreshaft was found at an ice patch. It contains traces of what appear to be red ochre preserved on the stone projectile point, which is secured in a slotted haft by sinew lashing. In addition, almost one-half of a shallow birch bark basket was recovered from the edge of another melting ice patch (*Figures 8-9*). This circa 650-year-old artifact suggests that ice patches were used for purposes other than hunting.

A total of nine historic sites were discovered during the survey. Six of the historic sites, all probably dating to the Chisana gold rush, circa 1913 AD (*Bleakley 1996*), were discovered lying directly on glacial ice.

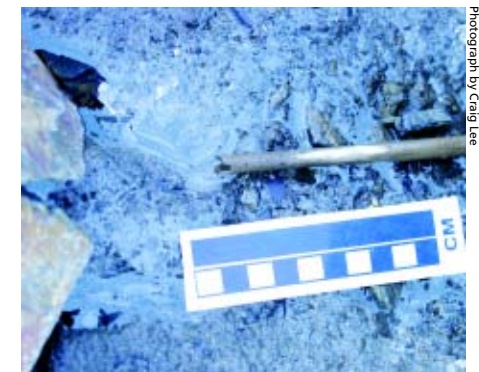
Artifacts at these sites include horse hoof trimmings and horseshoe nails (evidence of a horse being shod on the glacier), metal can fragments and other metal objects including a frying pan and a bucket, and a variety of cut wood. The remains of an entire “roadhouse” that provisioned and sheltered travelers traversing a glacier during the 1913 gold rush (*Bleakley 1996*) were observed distributed throughout a 0.4 mi² (1 km²) area on the glacier’s surface.

Although difficult to quantify, a variety of methods have been employed to estimate the melting rate of mountain and subpolar glaciers (*e.g., Dyurgerov 2001, 2002*). These data demonstrate increased glacial melting began in the mid-1960s, and dramatically increase beginning about 1988. The late 1980s increase in glacial melting roughly corresponds to the beginning of reports of archeological discoveries from high altitude glaciers and ice patches around the world. If this trend continues, it is reasonable to assume that archeological and paleontological remains will continue to be exposed over the next few decades. Ice patch research also provides opportunities to better understand ice patch dynamics in relation to climate change and their role in regional ecology. It is possible that these ephemeral sites could largely disappear in the near future. Consequently, it is important to better understand them and collect, study, and preserve the artifacts they contain before they are lost forever.

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Photograph by Craig Lee

Figure 7. The nock end of an arrow shaft melting from glacial ice.



(Right) Figure 8. Ruth Ann Warden and James Dixon examine a birch bark basket at the base of a retreating ice patch.



(Far Right) Figure 9. The birch bark basket, with a detail of the stitching holes.

REFERENCES

- Arctic Climate Impact Assessment (ACIA). 2005.
Cambridge University Press. <http://www.acia.uaf.edu>.
- Bleakley, Geoffrey T. 1996.
A History of the Chisana Mining District, Alaska, 1890-1990. National Park Service Resources Report NPS/AFARCR/CRR-96/29.
- Dixon, E. James. 1985.
Cultural Chronology of Central Interior Alaska.
Arctic Anthropology 22(1):47-66.
- Dixon, E. James, William F. Manley, and Craig M. Lee. 2005.
The Emerging Archaeology of Glaciers and Ice Patches: Examples from Alaska's Wrangell-St. Elias National Park and Preserve.
American Antiquity 70(1):129-43.
- Dyurgerov, Mark B. 2001.
Mountain Glaciers at the End of the Twentieth Century: Global Analysis in Relation to Climate and Water Cycle.
Polar Geography 24(4):241-336.
- Dyurgerov, Mark B. 2002.
Glacier Mass Balance and Regime: Data of Measurements and Analysis. *Institute of Arctic and Alpine Research Occasional Papers*, edited by Mark Meier and Richard Armstrong. No. 55. Boulder, Colorado.
- Hare, Greg P., Shelia Greer, Ruth Gotthardt, Rick Farnell, Vandy Bowyer, and Charles Schweger. 2004.
Multidisciplinary Investigations of Alpine Ice Patches in Southwest Yukon, Canada: Ethnographic and Archaeological Investigations.
Arctic 57(3).
- Holtmeier, Friedrich-Karl. 2003.
Mountain Timberlines: Ecology, Patchiness, and Dynamics. Kluwer Academic, Boston.
- Post, Austin and Mark F. Meier. 1980.
A Preliminary Inventory of Alaskan Glaciers. In *World Glacier Inventory*, IAHS-AISH Publication 126:45-47.
- Rainey, Froelich. 1939.
Archaeology in Central Alaska.
Anthropological Papers of the American Museum of Natural History 36(3):351-405.
- Shinkwin, Anne D. 1979.
Dakah De'nin's Village and the Dixthada Site: A Contribution to Northern Athapaskan Prehistory. National Museum of Man, Mercury Series, Archaeological Survey of Canada Paper No. 91. National Museums of Canada, Ottawa.