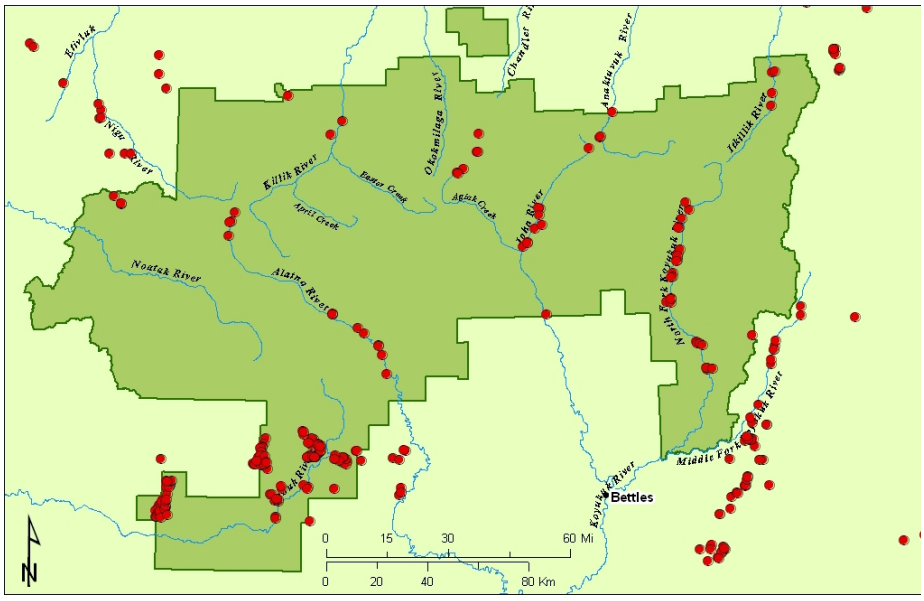
National Park Service
U.S. Department of the Interior

Gates of the Arctic National Park and Preserve

Prehistoric Networking: Obsidian in Gates of the Arctic National Park and Preserve

Long before the boundaries of the Gates of the Arctic National Park were on the map, people used the volcanic glass known as obsidian to fashion projectile points, hide scrapers and other tools. Archaeologists today are especially interested in these obsidian artifacts because they can tell presicely where each piece of obsidian was collected and how far a person, thousands of years ago, carried their tools. Tracing obsidian also allows archaeologists to make connections between archaeological sites.

This research is possible because each obsidian source has a unique chemical signature. Several methods can be used to identify this signature and the geographic source of the material. So far, close to 200 obsidian artifacts from Gates of the Arctic have been analyzed. The obsidian entered the central Brooks Range almost exclusively from the Batza Tena source on the Koyukuk River, more than 200 km (125 mi) south of the park.



Obsidian is found at over 200 archaeological sites in the Gates of the Arctic National Park and Preserve.

An obsidian flake from Itkillik Lake sourced to Group P. The source for this obsidian has not yet been discovered.

Formation of Obsidian

Obsidian is a volcanic glass that lacks a crystal lattice structure because it formed from a magma or lava that cooled very rapidly. This geological characteristic makes obsidian a perfect raw material for manufacturing stone tools because it flakes easily. When this liquid rock cools, it traps the elements present in the molten liquid. These trace elements occur in volcanic glass in variable amounts, thereby creating a unique chemical signature for any particular volcanic flow.

Obsidian Sourcing

The most reliable method of obsidian sourcing involves using X-ray fluorescence (XRF) or Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) to detect the combination and proportions of trace elements. The advantage of XRF spectrometers is that they do not destroy any part of the artifact during the analysis; ICP-MS leaves a scar barely visible with the naked eye. In addition, recent developments in the XRF technology have brought about portable instruments that make it possible to analyze artifacts within the museums rather than sending samples away for analysis.

Alaskan obsidian sources can be differentiated from one another by measuring levels of iron, rubidium, strontium, zirconium, and yttrium. Researchers have developed databases that keep records of all sourced obsidian. In all of Alaska, five obsidian sources are known and more than 20 sources are represented by archaeological samples from unknown geological sources. By finding more samples from unknown sources in archaeological sites researchers hope to determine an area where the source is likely to be located.

Results of Obsidian Sourcing

Obsidian occurs in 211 (16%) of the 1300 known archaeological sites in the Gates of the Arctic. So far, archaeologists have been able to source obsidian from 25 sites in several valleys, including the Killik, Alatna, Nigu, Itkillik, North Fork of the Koyukuk, and Hunt Fork of John River. Obsidian for this analysis was also obtained from sites on the shores of several lakes: Kurupa, Kipmik and Agiak.

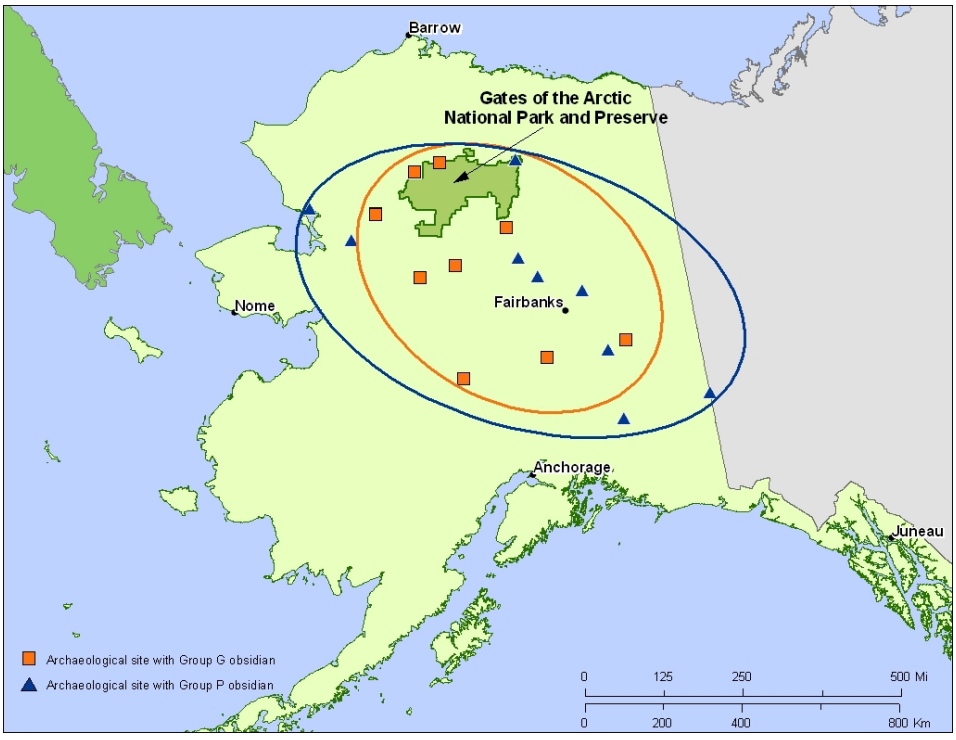
Most obsidian has been found on high knolls where soil accumulation is marginal and organic materials that can be dated (by radiocarbon methods, for example) are practically non-existent. However, based on characteristic stone tool forms and the few dated archaeological sites present in the park, archaeologists have determined that obsidian was used the entire time that people have occupied the valleys of the park, starting approximately 10,000 years ago.

Nearly all obsidian found in the park came from the Batza Tena source. Artifacts from this source are found across the state (excluding the Aleutian Islands and Southeast Alaska) and in all time periods. The shortest distance that the obsidian had to travel to the Gates of the Arctic from this source is 175 km (110 mi), the longest is 340 km (210 mi). It is no surprise that this obsidian is so common in the Gates of the Arctic, since the source is relatively close to the park and the Koyukuk River Valley connects the two.

Only two obsidian artifacts found in the Gates of the Arctic cannot be attributed to the Batza Tena source. These came from two different groups. A group designation singifies that artifacts with a particular chemical signature consistently appear at archaeological sites, however the physical source of that obsidian has not yet been discovered. One of these samples, found at Kurupa Lake, came from a source that is referred to as Group G. Group G obsidian is also found in archaeological sites in the western Brooks Range. Another artifact was attributed to Group P was found in the Bateman archaeological site on the shore of Itkillik Lake. The site was occupied approximately 1250 years ago. Group P obsidian has been found from the Canadian border west to the Holitna River in southwest Alaska and north to the Kobuk River in northwest Alaska.

It is telling that thousands of years ago people living in the central Brooks Range exploited obsidian sources that contemporary geologists have yet to rediscover. Prehistoric people were undoubtedly accomplished geologists and during their travels paid particular attention to the land and its resources. They actively prospected for raw materials important to their way of life, and at the same time acquired an intimate knowledge of their environment.

This obsidian sourcing study is a small component of a larger research project that is underway. Collaboration between the NPS, University of Alaska Museum and the Smithsonian Institution constantly produces new analyses of archaeological obsidian in Alaska. This preliminary investigation already hints at a much broader exchange network than previously realized.



Obsidian attributed to Groups G and P has been found at the archaeological sites shown on this map. The location of the sources for this obsidian remains unknown. However, it likely comes from somewhere in the ovals drawn around the artifact distributions for each of these groups.