

## Montana Earth Science Picture of the Week

### No Pots? No Pans? No Problem.

#### Fire-Cracked Rock . . .

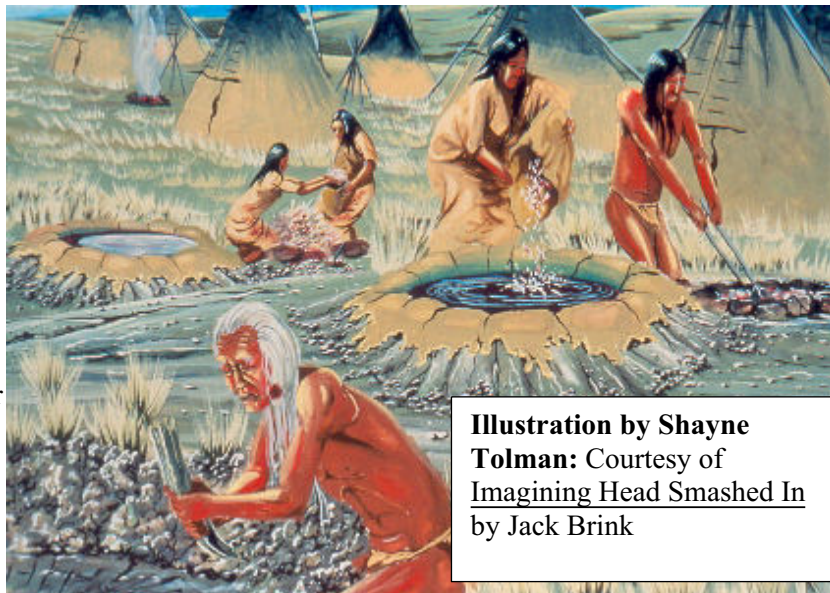
Bison bones, tipi rings, arrowheads, and other artifacts are types of evidence that help archaeologists determine whether a place was used by American Indians centuries ago. These signs help identify encampments, bison kill sites, trails, and places that were significant for spiritual reasons. However, as valuable as these clues are, archaeologists claim that one of the most reliable indicators that American Indians spent time at a location is the presence of fire-cracked rocks.

These rocks are the cracked or broken pieces of stones that were used to boil water or roast meat. Fist-sized rocks were heated in fires and then transferred into hide-lined pits or other containers to boil water, or place into dry pits to roast meat. Eventually this repeated heating and rapid cooling cracked the stones, causing them to break into recognizable pieces.

Fire-cracked rocks are especially abundant near bison kill sites . . . places where bison were driven into natural or man-made enclosures, into bogs or snow-banks, or over cliffs, and then finished off with various weapons. Experts estimate there are 8-10 tons of fire-cracked rock at the Head-Smashed-In Buffalo Jump in southern Alberta, and over 3 tons at the First Peoples Buffalo Jump near Great Falls (formerly called Ulm Pishkun).

#### Processing the kill . . .

Hot stones were an important source of heat in processing areas, which were often located near kill sites. These were areas where bison were butchered, jerky was



**Illustration by Shayne Tolman:** Courtesy of Imagining Head Smashed In by Jack Brink

made, hides and other parts were taken, and meat and bones were roasted or boiled. It's well known that Indians depended on bison for a significant portion of their food, and for materials used to make clothing, shelters, weapons, and tools. But perhaps the most under-rated resource obtained from bison in the processing area was "bone grease". This white fat (not marrow) obtained from the boiling of bone fragments was very valuable to the Indians as evidenced by the incredible amount of time and effort they put into removing it from the bones. Perhaps it contained

important nutrients that Indians didn't get from the lean meat of bison and other animals. This fat trapped in the bone matrix of the bison was extremely important, and rocks played an important role in helping collect it.

### **Harvesting the grease . . .**

Kill sites and processing areas varied, but typically bones were boiled in pits that had been dug with sticks, or tools fashioned from bones. Once the pit was dug, it was lined with a bison hide (furry side down), and filled with water, using bladders, or other containers. American Indians used rocks to crush the longer bones of the animal into pieces the size of potato chips or smaller. These were put into the water along with red-hot stones that were carried with sticks or antlers from a nearby fire. Heat from the stones cause the water to boil, liquefying the fats trapped in the bone matrix. These fats floated to the surface where they solidified as the water was allowed to cool. Finally, it was skimmed off. Much of the grease was used to make pemmican; a mixture of pulverized jerky and dried berries, held together by the nutritious grease.

### **Quartzite cobbles . . .**

Based on the fire-cracked rocks found at the Head-Smashed-In and First Peoples sites, its obvious that quartzite was the type of rock preferred by Indians who used these sites. It was chosen despite the presence of an abundant supply of sandstone at both places, and the reality that quartzite had to be transported from other places within the region. Quartzite worked well as a boiling stone because it is a hard, metamorphic rock formed from sandstone as heat and/or pressure fused the sand grains together. In contrast, sandstone didn't hold up nearly as well, easily breaking and adding sand to the water.

Although there are few places east of the Rockies where quartzite was formed, ice age glaciers transported many different types of rocks into Montana from Canada, including plenty of quartzite. Archaeologists who study processing sites find that several different types of rocks were used, but note that Indians preferred rocks that were hard and uniform, including some metamorphic rocks, some fine-grained igneous rocks, and even some well-cemented sedimentary rocks in some cases.

Any student of science knows that materials expand when heated and contract when cooled. So, no matter what kind of rock was used, it eventually fractured from stresses caused by repeated heating and rapid cooling. Eventually the pieces were too small to be conveniently used and the fire-cracked rocks were left behind.

**Sources:** Brink, Jack. Imagining Head Smashed In. Edmonton: Athabasca University Press, 2008.

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