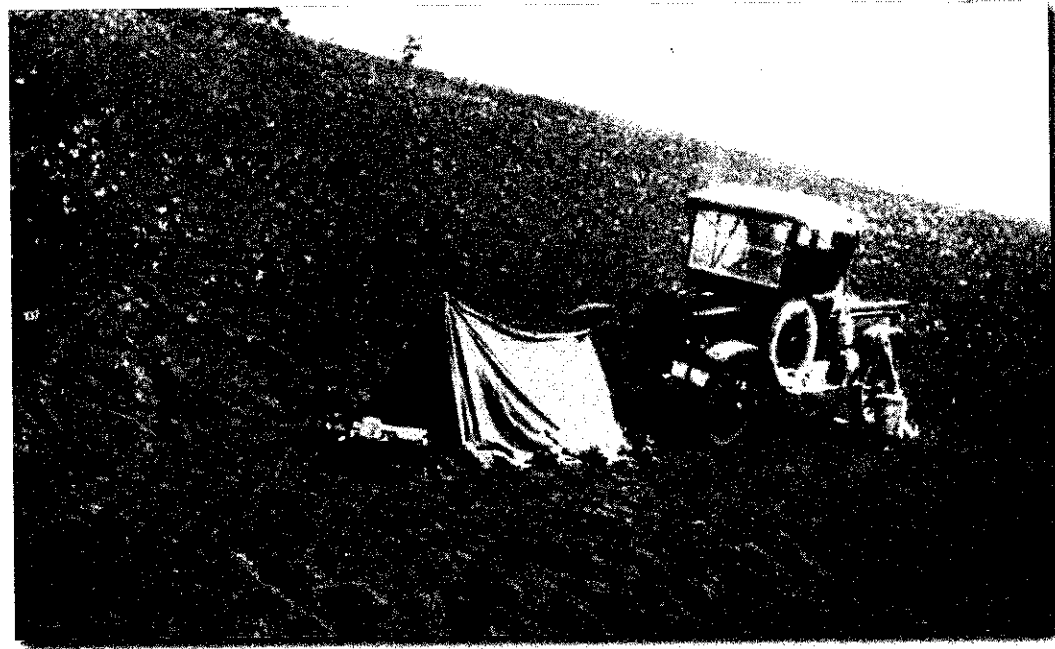


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A picturesque camp made by a lone geologist on the cinders of Inferno. Photograph by O.E. Meinzer, geologist in the United States Geological Survey, who visited the Craters of the Moon in June 1921. He made preliminary plans for a geologic survey of the area.

Prehistoric Use of Lava Tube Caves on the Eastern Snake River Plain

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INTRODUCTION

The archaeology of the Snake River Plain has been dominated by excavations in sheltered cave sites. Southeast of Craters of the Moon National Monument and on the eastern edge of the Great Rift are a series of lava tube caves that were used as locations to make stone tools, process and store food, and escape from the weather. The caves become accessible when sections of the lava tube collapsed creating openings in the ceilings of the hollow tubes. The accessible segments of the lava tube range from short, 50 ft. sections to intact sections over 700 feet long.

The study site contains eleven lava tube caves and the surface area between the cave openings. The caves include Raptor Cave (10BT2200), Coyote Lair Cave, Bat Snack Cave, Roadside Cave (10BT2246), Bat Hangout Cave, Corroded Abode Cave, Hiker's Oasis Cave, Swiss Cheese Ceiling Cave, Unnamed Cave, Bobcat Cave (10BM56), and Condor Cave. The surface surrounding each of the caves is littered with varying quantities of lithic debitage. Most of the cave interiors contain evidence of prehistoric use.

THE CAVES

Raptor Cave (10BT2200) is part of a lava tube system originating from the Serviceberry Butte lava flow. The cave is part of a lava tube system with two collapsed cave openings near a depressed but not collapsed section of lava tube. A surface survey located a dense lithic scatter centered near each of the cave openings and extending over 300 meters.

The floor of Raptor Cave is composed of a mixture of sand and boulders. A majority of the ceiling is over six feet high. Depending on the time of day, there is adequate light to allow movement throughout the cave. To the south of the main chamber is a secondary chamber that has a lower floor level and is 8° Fahrenheit colder than the main chamber.

Raptor Cave contains twenty-five well preserved rock art panels painted in vivid colors

ranging from yellow and pale red to deep red. The rock art panels depict images of animals, humans, and geometric shapes. Stylistically, the rock art dates from 200 to 1,500 years before the present. (Merrell, 2002)

In 2002, due to extensive pothunter damage, the Idaho Falls District of the Bureau of Land Management and the University of Idaho conducted an excavation within Raptor Cave. The excavation produced flaked lithic tools, modified flakes, a quantity of debitage, and a single pottery shard. In addition to lithic artifacts the excavation produced a variety of faunal artifacts and charcoal. The faunal assemblage included elements from small, medium, and large mammals. Charcoal yielded radiocarbon dates that spanned from 420 +/- 40 B.P. to 2,910 +/- 40 B.P. The range of dates confirmed that the site contained undisturbed

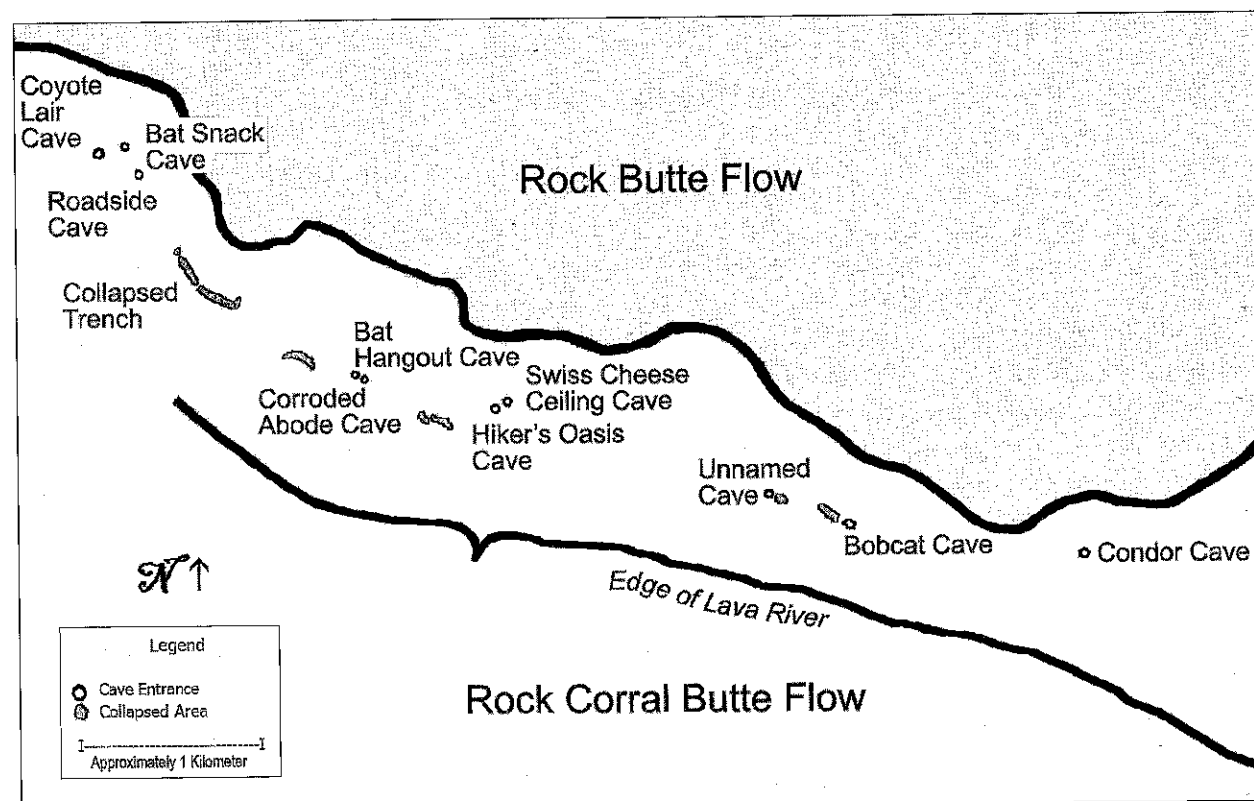


Figure 1. The remaining ten study site caves are located 13.5 miles to the east of Raptor Cave Lava, originating from a vent at Rock Corral Butte which formed a lava river that flowed east along the south edge of Rock Butte flow. Near the center of the lava river is a lava tube containing numerous collapsed segments and cave entrances.

deposits and established a record of cave use that spans nearly three thousand years.

The remaining ten study site caves are located 13.5 miles to the east of Raptor Cave (see Figure 1). Lava originating from a vent at Rock Corral Butte formed a lava river that flowed east along the south edge of the Rock Butte flow. Near the center of the lava river is a lava tube containing numerous collapsed segments and cave entrances.

The most western site, Coyote Lair Cave has a wide opening with little depth. The west facing entrance allows for excellent light and sufficient air circulation for fire building. Lithic debitage is concentrated near the cave entrance and includes a high number of primary decortication flakes, large cores, large broken bifaces, as well as a number of prismatic blade fragments. The close proximity of the obsidian sources at Big Southern Butte and Cedar Butte contributes to the heavy concentration of debitage. Lithic debitage extends from Coyote

Lair Cave to the next cave to the east.

Bat Snack Cave is the eastern entrance of a double entrance cave. The cave is surrounded by a dense lithic scatter, and several pottery fragments were found south of the entrance. The cave has a sand floor and adequate air circulation necessary for fire construction. Roadside Cave (10BT2246) is the western entrance into the same section of lava tube (Sappington et al., 2003).

Due to pothunter vandalism, Roadside Cave was excavated by Bureau of Land Management and University of Idaho archaeologists in 2004. The minimal excavation produced flaked lithic tools, battered cobble tools, and extensive quantities of debitage. The excavation also uncovered a variety of faunal remains from small, medium, and large mammals. A high percentage of the bone fragments were burnt.

Excavated artifacts were submitted for protein residue testing and produced positive reactions for rat, chicken (sage grouse), bovine

(bison), and rabbit antiserum (Parr, 2005 in Sappington et al., 2005). The diversity of faunal remains and the results of protein analysis indicate a wide range of faunal utilization within the cave. The non-vandalized areas had intact stratigraphy, and every level contained charcoal. Samples were submitted for radiocarbon dating and produced a datable chronology for the cave spanning from 1,260 $\pm$ 30 B.P. to 1,890 $\pm$ 60 B.P. The distribution of radiocarbon dates confirm that the cave contained undisturbed materials and indicated nearly 2,000 years of cave use.

The next entrance to the Rock Corral Butte lava tube is located further to the east. Lithic scatter becomes quite dense approximately 100 feet from the depression containing Bat Hangout Cave. The small overhang creates a sheltered area with little depth. The open, rounded ceiling provides shelter, adequate light, and air circulation adequate for fire construction.

Nearby, the entrance to Corroded Abode Cave is an attractive sheltered area while the depths of the cave are less inviting. An obsidian point midsection was found in the entrance of the cave, and limited lithic scatter extends around the cave opening. The long cave requires additional artificial light, and low air circulation would limit fire construction.

East of Corroded Abode Cave is a section of entirely collapsed lava tube. The collapsed area forms a natural canyon-like depression that is 10 to 20 feet lower than the surrounding area. The collapsed area provides shelter from the ever present wind. There is limited lithic debitage throughout the depression and along the rim of the collapse.

East of the collapsed canyon-like area are the next sets of caves. The lithic scatter progressively becomes thicker as one approaches the collapsed area containing openings to Hiker's Oasis Cave and Swiss Cheese Ceiling Cave. Hiker's Oasis Cave is a short cave with adequate light throughout. The double entrances allow air circulation necessary for fire construction. The open and well lit character of the cave makes it an ideal living

area. After climbing out of the north entrance of Hiker's Oasis Cave, the entrance for Swiss Cheese Ceiling Cave becomes visible. The long Swiss Cheese Ceiling Cave is poorly lit and artificial light is needed within thirty feet of the entrance. The awkward entrance and lack of light would have made this cave less inviting for habitation.

The next section of the Rock Corral Butte flow lava tube is composed of a complex of collapsed depressed areas and intact sections of lava tube. The Bobcat Cave complex includes three caves and a number of canyon-like depressed areas. The first cave, Unnamed Cave, has a small entrance and a low ceiling. The small cave has two smaller side channels that are 5-8° Fahrenheit cooler than the main cave. The side channels are partially filled with soil and impossible to enter at this time.

East of Unnamed Cave is a series of collapsed depressions and intact sections of lava tube. The depressions provide protection from the wind and contained limited quantities of lithic debitage. The most eastern collapse is surrounded by a moderate lithic scatter and contains the entrance to Bobcat Cave (10BM56). Bobcat Cave is a double chamber cave with a single small entrance. The upper chamber contains numerous rock art panels composed primarily of groupings of tally marks. The lower chamber maintains a freezing temperature and contained numerous antler tine and hammerstone artifact clusters that may have been used in coordination to chip ice or frozen meat from between boulders in the lower chamber. (Henrikson, 1996)

In 1987 and 1989 members of Idaho State University field schools and the Idaho Falls District BLM archaeologist conducted a series of excavations on the surface and in the lower chamber of Bobcat Cave. Excavations in the lower chamber uncovered two informal fire basins and a constructed sagebrush feature. The sagebrush feature tested positive for antelope and canid antiserum and may have been part of a cold storage area. Samples of burned sagebrush and bone fragments were

submitted for radiocarbon dating and produced dates ranging from 4,360 +/- 70 B.P. to 4,110 +/- 70 B.P. (Henrikson, 1996)

The final cave in the study area is located east of Bobcat Cave. Condor Cave is a deep faunal trap with no easy entrance. The cave is entered by repelling over thirty feet to the bottom of the cave. An extensive survey surrounding the cave entrance revealed only a single flake. There has been extensive historic use of the cave and any evidence of prehistoric use may have been previously collected.

Aerial surveys indicate that Condor Cave is the last opening in the Rock Corral Butte lava tube. Satellite images show a widening and emptying of the lava river approximately one half of a mile east of Condor Cave. The distance from the first cave, Coyote Lair Cave, to the last, Condor Cave, measures 5.6 kilometers.

DISCUSSION

Analysis of these eleven lava tube caves show that they have been used for a variety of purposes including habitation, cold storage, as water sources, and as sites for animal processing and lithic production.

Several caves have features making them more comfortable including flat soft floors, shelter from the wind, light, air circulation, and comfortable temperatures. Habitable caves include Raptor Cave, Coyote Lair Cave, Bat Snack Cave, Roadside Cave, Corroded Abode Cave, and Hiker's Oasis Cave. Each one has large, open, and easily accessible entrances that provide egress as well as admitting light into the cave entrance. The double entrances at Raptor Cave, Roadside Cave, and Hiker's Oasis Cave allow for increased light within the cave as well as increased air circulation. Excavations at Raptor Cave, Roadside Caves, and Bobcat Cave uncovered evidence of repeated fire construction.

Constant air temperature adds to the comfort and habitability of the caves. During the summer of 2005, most of the caves had a constant temperature between 52° and 55° Fahrenheit and were quite cool when compared

to the 100° Fahrenheit surface temperature. During the cold winter months the insulating qualities of the lava rock keep the caves significantly warmer than the sub-zero surface temperature. Not all of the caves have a comfortable temperature, and several caves maintain freezing temperatures year-round. Temperatures in the lower chambers of Bobcat Cave and Raptor Cave are below freezing and both caves contain quantities of ice providing an area for frozen food storage and ice collection.

In addition to ice, several caves contain water. Eroded water channels run from the entrance into the interior of Raptor Cave, Bat Snack Cave, Roadside Cave, Corroded Abode Cave, Hiker's Oasis Cave, and Swiss Cheese Ceiling Cave. Water enters during the winter as ice and snow, and once melted the water percolates into cave soil. Water also enters by dripping from the surface, through the ceiling, and into the caves. Cave water may be collected by placing containers below ceiling drips or by excavating pond areas in the cave floor. Excavated areas were found in most caves with eroded floor channels.

Faunal and lithic materials indicate that the caves have been used as locations for the processing of animals for food and hides. The area surrounding the caves provides an excellent opportunity for hunting sage grouse, rabbits, deer, elk and formerly bison. Hunting blinds were located near Raptor Cave and on a rise near Coyote Lair Cave. The areas between the cave entrances provide grassland habitat for grazing animals, and several water containing playa locations contain seasonal water to attract birds and animals.

The cave sites contain archaeological evidence for a wide variety of faunal utilization. Excavations in Roadside Cave and Raptor Cave uncovered fragments of burnt bone indicating cooking activities. Raptor Cave, Roadside Cave, and Bobcat Cave all contained modified and unmodified bone fragments indicating cultural bone fragmentation. Lithic tools such as modified flakes, steep-ended uniface, and perforators are used to process and prepare

food and hides for use.

Excavations at Raptor Cave recovered twenty-three modified flakes and one steep-ended uniface. Roadside Cave excavations uncovered sixty-six modified flakes, seven steep-ended uniface, and a T-shaped perforator. The presence of steep-ended uniface and the perforator indicate on-site hide preparation and assembly. Additional steep-ended uniface were found on the surface near Raptor Cave, Coyote Lair Cave, Bat Snack Cave, Roadside Cave, Corroded Abode Cave, and Bobcat Cave. Modified flakes were found on the surface near all of the caves with the exception of Condor Cave. Evidence of food storage was found in the lower chamber of Bobcat Cave. The cold chamber provided a convenient location to freeze and store bison, antelope, and other animals.

The caves and the cave entrances provided locations to produce and repair lithic tools. Raptor Cave, Coyote Lair Cave, Bat Snack Cave, Roadside Cave, and Bobcat Cave had significant lithic scatters surrounding the cave entrances. The lithic scatter contained primary and secondary flakes as well as finished tools. Lithic scatter at Coyote Lair Cave, Bat Snack Cave, and Roadside Cave included a number of large cores and cortex containing debitage of primary and secondary flakes indicating the initial stages of tool manufacture. A small oval feature in Roadside Cave contained primarily secondary and tertiary lithic flakes. Bat Hangout, Corroded Abode Cave, Swiss Cheese Ceiling Cave, and Unnamed Cave have more limited lithic debitage surrounding the cave entrances. Debitage surrounding these caves include biface fragments, utilized flakes, and secondary flakes indicating on-site tool exhaustion. The absence of lithic debitage at Condor Cave may be attributed to previous surface collection.

Analysis of lava tube caves contributes to an expansion of our understanding of Archaic subsistence strategies on the eastern Snake

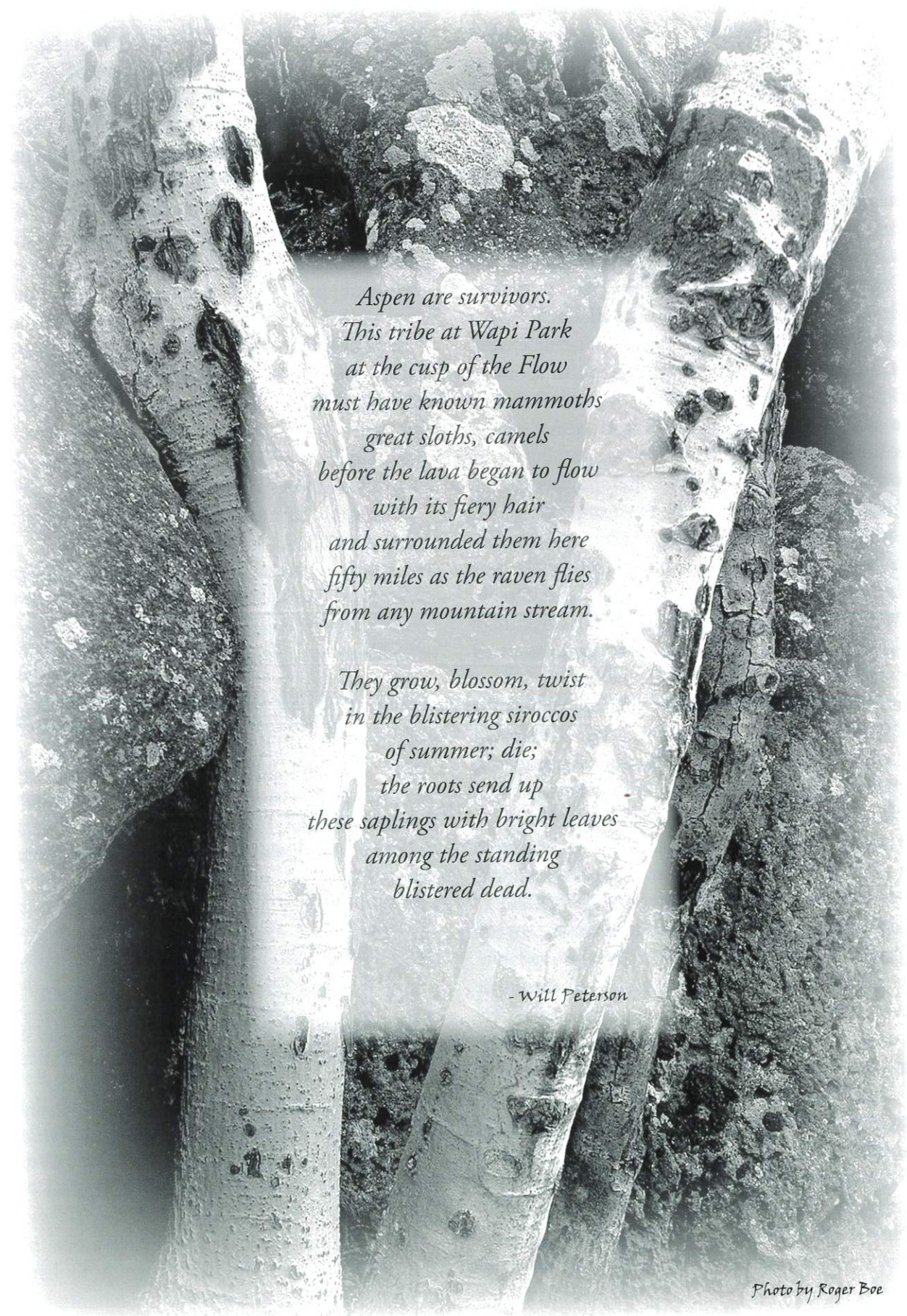
River Plain. Early theories of subsistence have focused on seasonal cycles of resource acquisition. These theories have failed to see any value in the arid region surrounding the cave sites. The previously unknown caves offer locations for habitation, lithic production, water acquisition, and food processing and storage. Further investigation in lava tube caves will improve our understanding of prehistoric life on the Snake River Plain.

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*Aspen are survivors.
This tribe at Wapi Park
at the cusp of the Flow
must have known mammoths
great sloths, camels
before the lava began to flow
with its fiery hair
and surrounded them here
fifty miles as the raven flies
from any mountain stream.*

*They grow, blossom, twist
in the blistering siroccos
of summer; die;
the roots send up
these saplings with bright leaves
among the standing
blistered dead.*

- Will Peterson

Photo by Roger Boe

Seeking the Source: Obsidian XRF Analysis of Projectile Points from the Craters of the Moon National Monument and Preserve

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INTRODUCTION

The National Park Service has asked the University of Oregon Museum of Natural and Cultural History to apply GIS in the analysis of new and existing archaeological data at the Craters of the Moon National Monument and Preserve in south-central Idaho in order to develop a management plan for its cultural resources. While the ultimate goal of this research is to test the archaeological data from the Preserve against a deductive model already developed for the entire eastern Snake River Plain, this paper focuses on the results of an X-Ray Fluorescence, or "XRF" analysis, of volcanic glass artifacts recovered from the Preserve over the last 20 years.

In areas characterized by volcanic activity, such as the Snake River Plain and surrounding mountains, basaltic flows of tool quality obsidian are fairly common. Thus obsidian artifacts dominate the assemblage from most prehistoric archaeological sites in the region. Obsidian was selected by aboriginal groups for its unique qualities. Although not as durable as silicates, it is very accessible, easily knapped, and is extremely sharp.

METHODS

While obsidian scrapers, knives, multipurpose tools, and waste flakes are often found during survey and recovered during excavations, only diagnostic projectile points that could be assigned a temporal period were used during this research. By sourcing a wide range of projectile points recovered from sites throughout the study area we hoped to address questions regarding changes in volcanic glass source utilization through time. We also hope to be able to detect possible prehistoric trade routes and changes in the seasonal round which we will examine against the deductive model.

XRF analysis is a nondestructive analytical technique used to diagnose trace elements in volcanic glass. This technique looks at the

molecular make-up of different elements in various samples. Since the percentage of trace elements in obsidian, the most common of the volcanic glasses, varies from source to source, it is possible to locate the specific geographic locations from which the raw stone used in the manufacture of individual artifacts originated. This is done by comparing the element values used to characterize the samples to those for known obsidian sources reported in the literature and with unpublished trace element data collected through analysis of geological source samples. The projectile points used in this study were analyzed by Northwest Research Obsidian Laboratory, and were attributed to a source if their trace element values fell within two standard deviations of the known upper