

develop protective measures for those areas where necessary. Many historically used areas are no longer open to Tribal members, due to private property ownership and access issues. Much like archaeological sites, traditional use areas on public lands can be threatened by Off Highway Vehicle use, livestock overgrazing, mineral material extraction, wildfires, firefighting activities and noxious weed invasions. Some possible protective measures available to federal agencies are the installation of fences, road closures to limit vehicle traffic, formal withdrawal of land from mineral entry, public education/interpretation and the designation of Areas of Critical Environmental Concern (ACEC) as formal recognition of an area's importance. Agencies can reseed areas with native plants after wildfires and spray for noxious weeds. An example of a recent success, in 2004 the BLM worked with the adjacent private landowner to fence livestock out of Carey Hot Spring and preserve the natural vegetation, which includes traditional plants like willow and bull rush.

We hope through our continued and combined efforts we can protect more

traditional use areas like Carey Hot Springs. In addition, we will continue to identify new areas where Tribal members can once again collect natural resources in this vast traditional cultural property now known as the Great Rift.

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Photo by Roger Boe

Using Geospatial Data to Interpret the Holocene Archaeological Record on the Craters of the Moon National Monument and Preserve

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INTRODUCTION

Archaeologists have, for decades, searched for "patterns" that might reveal the myriad of variables that influence where humans choose to live. This is based on the widely held assumption that: 1) environmental factors play a strong role in such patterns, and 2) these patterns can be quantified and explained (Wheatley and Gillings, 2002). The development of Geographic Information Systems (GIS) and their ability to analyze large quantities of data has provided archaeologists with an extremely valuable tool. Programs such as ArcView and ArcMap, that utilize GIS concepts, can integrate archaeological information with geologic, topographic, hydrographic and other data sources within hours rather than months or years (Wheatley and Gillings, 2002).

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 order to develop a management plan for its cultural resources. The ultimate goal of this research is to test the archaeological data from the Preserve against a model already developed for the eastern Snake River Plain (Henrikson, 2002).

ENVIRONMENTAL BACKGROUND

The Craters of the Moon National Monument and Preserve (henceforth referred to as The Preserve) is comprised of 750,000 acres of which almost 500,000 are covered by late Pleistocene and Holocene basalt flows. The remaining acres are primarily contained within "kipukas", a Hawaiian term that refers to an island of land surrounded by lava on all sides. The Preserve can boast of containing the largest kipuka in the world, referred to as Laidlaw Park.

Volcanism is an important consideration that is often overlooked in the investigation of Snake River Plain prehistory. The current character of the plain was established roughly

10 million years ago by continuous pahoehoe flows from fissure eruptions or vents that range between 1 and 2 kilometers across (Kuntz et al., 1986, 1992). There are eight lava fields on the eastern Snake River Plain that formed during the terminal Pleistocene and Holocene, well within the timeframe of human occupation. The Craters of the Moon lava field is the largest in the continental United States and represents eight separate eruptive periods ranging in age from roughly 15,000 years ago to 2000 years ago (Kuntz et al., 1986, 1992).

Specific eruption phases may have had significant impacts on the pre-contact Shoshone seasonal round. These impacts may have come as harmonic tremors with the opening of fissures

and steam vents, the eruption of lava fountains and tephra cones and large quantities of lava exuding from open fissures. Some extended eruptions may have lasted for months or a few years. The Wapi lava field, dating to around 2000 years ago, probably remained active for several months, while the massive Minidoka flow, which occurred around 4000 years ago, may have created unsuitable air quality and temperatures in the vicinity for years (Kuntz et al., 1986). The Minidoka flow may have also closed the area to game animals and people alike for an extended period, until creatures began entering the resultant "kipuka" at a later date when the eruptions ceased (Henrikson, 2002).

Many GIS analyses have included elevation, slope, aspect, distance to water, vegetation communities and soil type as independent variables (Carmichael, 1990; Ringe, 1992). In 1992, Brenda Pace tested a predictive model for the Idaho National Laboratory, located just northeast of the Preserve and found that variables such as slope and aspect do not appear to have a significant influence on prehistoric site distributions. Instead, she discovered higher frequencies of sites near the edge of the Cerro Grande flow than elsewhere and argued that the prominent ridgelines that characterize these edges could have formed their own productive microenvironments (Ringe, 1992). Her striking results indicated that although lava flows may have been barriers during and immediately following volcanic eruptions, they eventually became highly productive areas surrounded by less productive sagebrush steppe.

A geospatial analysis of archaeological data on BLM lands in southeastern Idaho indicates that the ephemeral ponds that dot the landscape of the Snake River Plain also influenced the distribution of prehistoric sites (Henrikson, 2002). Ephemeral ponds provided a critical source of water and food for humans, large and small game, and waterfowl in the spring and early summer. The numerous archaeological sites that surround these features suggest that they were indeed a significant resource to the

Shoshone. Because the Preserve contains extensive lava edges as well as hundreds of ephemeral ponds, our current research efforts posed a tremendous opportunity to understand the role of these landscape features in the Shoshone seasonal round.

SPATIAL ANALYSIS OF ARCHAEOLOGICAL DATA

Due to the combined efforts of the BLM, NPS, and the University of Oregon, roughly 60,000 acres of the Preserve have been intensively inventoried for archaeological resources. As a result of these efforts, a total of 275 prehistoric sites have been recorded. In order to delineate the different types of archaeological sites encountered in the Preserve, each site was assigned a category based on the variety of artifacts encountered. These categories include residential base, short-term base camp, and field camp.

Residential bases include projectile points, drills, scrapers, edge-modified flakes, groundstone and ceramics. The presence of such items suggests multiple activities performed by small family groups (including women and children). Significantly, residential bases also include more permanent site furniture such as house floors, storage pits and fire pits (Thomas, 1983). Short-term base camps lack physical evidence of houses or other more permanent structures that would suggest intensive, sustained occupation. The occupation of base camps is expected to last only a few weeks and would contain evidence of the processing and consumption of only seasonal resources. Field camps are associated with the procurement of a single resource and occupied for a very brief period of a day or two (Thomas, 1983:79). Field camps are usually representative of hunting activities (e.g., kill sites, game surveillance locations or over-night "stop-off" points between kill sites and base camps). These are the most common site types found on the Preserve.

A geospatial analysis of the distribution of residential bases, base camps, and field camps

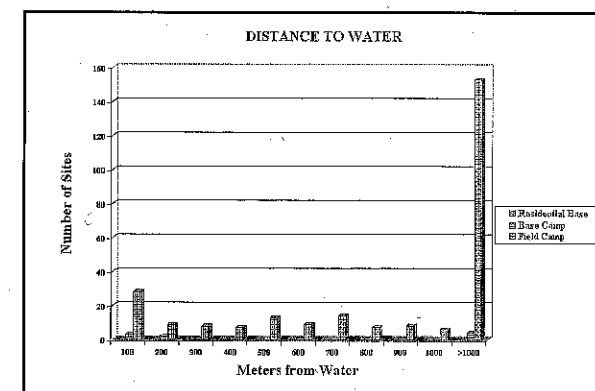


Figure 1 - Cumulative graph showing the location of archaeological sites in relation to permanent and ephemeral water sources.

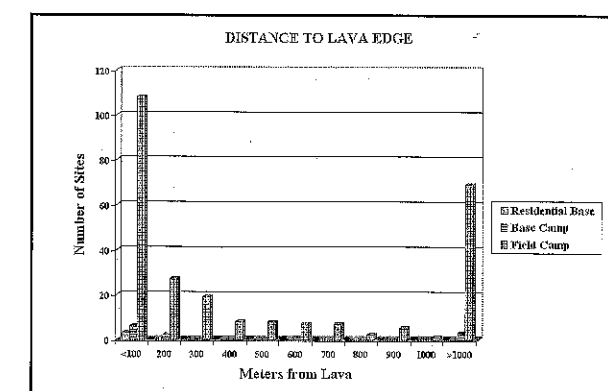


Figure 2 - Cumulative graph showing the location of archaeological sites in relation to the lava edge.

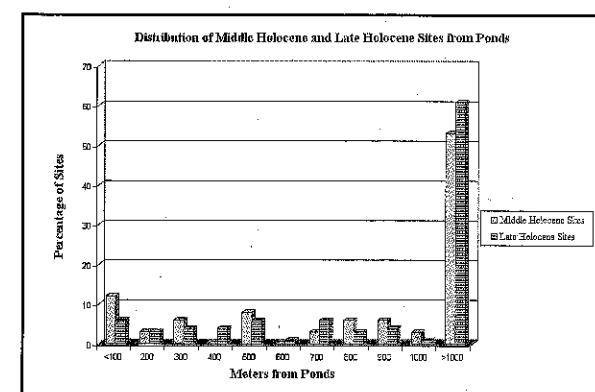


Figure 3 - Cumulative graph showing the location of middle and late Holocene sites in relation to permanent and ephemeral water.

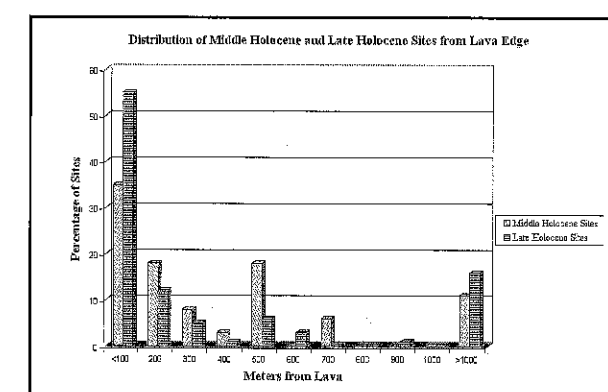


Figure 4 - Cumulative graph showing the location of middle and late Holocene sites in relation to the lava edge.

in relation to ephemeral ponds suggests that there is not a strong correlation between ponds and archaeological sites on the Preserve (Figure 1). In contrast, there appears to be a very strong positive correlation between lava edges and the distribution of archaeological sites (Figure 2). In fact, all of the residential bases, 8 of the 12 base camps and a large percentage of field camps documented on the Preserve are located at the lava edge. In other words, if people had a choice between camping at ponds or against lava flows, they preferred the latter.

As stated earlier, some potential advantages of residing at lava edges have already been brought to light by Pace's (1992) analysis of site distributions on the Idaho National Laboratory. During the winter, the lava edge captures drifting snow, which during spring and early summer months, provides essential moisture for grasses such as Great Basin Wild

Rye, Indian Rice Grass and various forbs. These highly productive vegetation communities would have been attractive for both animals and humans. In addition, numerous alcoves and rock shelters along the lava edge provided shelter from the ever blowing wind.

Depressions in the lava flow, created by excavating basalt, have been previously recorded near archaeological sites. Although previously suspected to contain water, recent work by Mark O'Brien (2005) indicates that these features may contain water or ice through April. Continued research will involve revisits to a number of sites to confirm the presence of water in these catchments.

SNAKE RIVER PLAIN PROJECTILE POINT CHRONOLOGY

In order to gain additional insight regarding the role of ephemeral ponds and lava flows in the

Shoshone seasonal round, it was important to test whether this pattern of utilization remained stable over the past 7500 years. It was therefore necessary to examine the archaeological data through time. Because projectile point styles on the Eastern Snake River Plain have changed over the last 12,000 years, these artifacts can be used to assign a period or periods of occupation when found at archaeological sites (Reed et al., 1986). A projectile point chronology for the eastern Snake River Plain has been presented, with slight variations, by Butler (1986), Franzen (1981), Reed et al. (1986), and Ringe (1992). Diagnostic projectile points were recovered from about 100 sites within the Preserve, allowing us to identify when sites along the lava edge and at ephemeral ponds were occupied. However, before discussing the results of our analysis, a brief overview of the projectile point chronology of the eastern Snake River Plain is in order.

The early Holocene on the eastern Snake River Plain is generally characterized by large fluted and stemmed points dating from about 12,000 to roughly 7,500 years ago (Reed et al., 1986). It should be noted that projectile points from the Early Holocene have not been recovered from the Preserve, suggesting that this portion of the Snake River Plain was initially occupied at the beginning of the middle Holocene, around 7,500 years ago.

The earliest points found on the Preserve are smaller stemmed and notched dart points. These are thought to have been manufactured for use in harvesting bison, antelope, big horn sheep and smaller animals as part of a broad-spectrum subsistence base. The beginning of the late Holocene, around 3500 years ago, was dominated by large corner-notched points; however, with the development and domination of bow and arrow technology, approximately 1,500 years ago, we see an emergence of small corner-notched and side notched projectile points.

DISCUSSION

With the help of project points, GIS

analysis has generated some interesting patterns regarding the utilization of lava edges and ephemeral ponds over the last 7,500 years. For example, if we examine the distribution of middle Holocene archaeological sites (sites dating between 7,500 and 4,000 years ago) and late Holocene sites (those dating after 4,000 years ago) in relation to ephemeral ponds, we don't see a notable difference (Figure 3). A slightly greater percentage of middle Holocene sites are located near ponds, but it is not a statistically significant increase. However, if we examine the distribution of middle Holocene versus late Holocene sites in relation to lava edges, we do see a significant increase in the utilization of the lava edge during the last 4,000 years (Figure 4).

What can account for this more intensive use? One possible explanation could be that the productivity of plant communities at lava edges improved due to increased rainfall during the late Holocene. However, existing paleoclimatic data do not indicate any significant changes in effective moisture on the eastern Snake River Plain.

Instead, the more intense utilization of lava edges during the late Holocene may be correlated with an overall increase in site density in the region. The number of archaeological sites dating to the late Holocene on the Preserve is more than double the number of middle Holocene sites, suggesting that human populations were increasing on the eastern Snake River Plain during the last 4,000 years. Although we can't completely eliminate environmental factors without pursuing additional paleoclimatic data, some recent discoveries on the Preserve suggest that, during the last 4,000 years, there were perhaps other incentives for camping at the lava edge.

One of these discoveries includes Site 10BN389, a late Holocene site located in Laidlaw Park. The site contains all of the elements of a base camp, including stone tools, ceramics, ground stone and a rock feature that appears to be a 2,000-year-old bison roasting pit. However, just above the site, along the

crest of the lava edge are numerous rock features that are too high above the plain to be hunting blinds and are much more suggestive of defensive structures or lookouts. From these vantage points, individuals could see great distances on the open plain.

This recent discovery has provided new insights regarding the unusual location of a late Holocene residential base located on the eastern edge of the Preserve. Referred to as the Lost Lava Rings, the site consists of thirteen circular basalt features situated in a sheltered lava embayment located about 300 meters inside the Craters of the Moon lava field. Attached to the circular "house floors" are smaller, semi-circular rock rings that may have functioned as storage features (Henrikson, 2002). The selection of this location for a residential base seems odd, given the relatively inhospitable surroundings. (The Minidoka Flow, on which the site is located, is devoid of soil and vegetation). However, a small cave located on the southwest side of the embayment contains a deep pool of water generated from condensation as warm exterior air hits the interior walls of the cave.

Although this water source may have been a very attractive feature that would have encouraged use of the embayment, it is probably not the only factor involved in selecting this location as a residential base (Henrikson, 2002). However, the house features at the Lost Lava Rings Site are not positioned at the highly productive lava edge but are located on barren basalt 300 meters into the flow. Rather, this location is more suggestive of a strategic defense location.

Recent investigations at site 10BN861 have also challenged our assumptions regarding the significance of ephemeral ponds in the distribution of prehistoric sites. One perceived disadvantage of camping at the lava edge has been the absence of water. The availability of water at the Lost Lava Rings site was considered an anomaly. However, this newly documented base camp located across a narrow finger of lava from 10BN389 indicates that water may have been available at the lava edge. An extensive

trail system extends from the site into the flow and terminates at deep pits in the basalt.

It is currently suspected that these small depressions may have held water from melting snow during the spring and early summer, however, confirmation will require additional visits to the site. If water is found in these depressions, our current assumptions regarding the role of ephemeral ponds and lava edges in the Shoshone seasonal round may need to be revised.

CONCLUSIONS

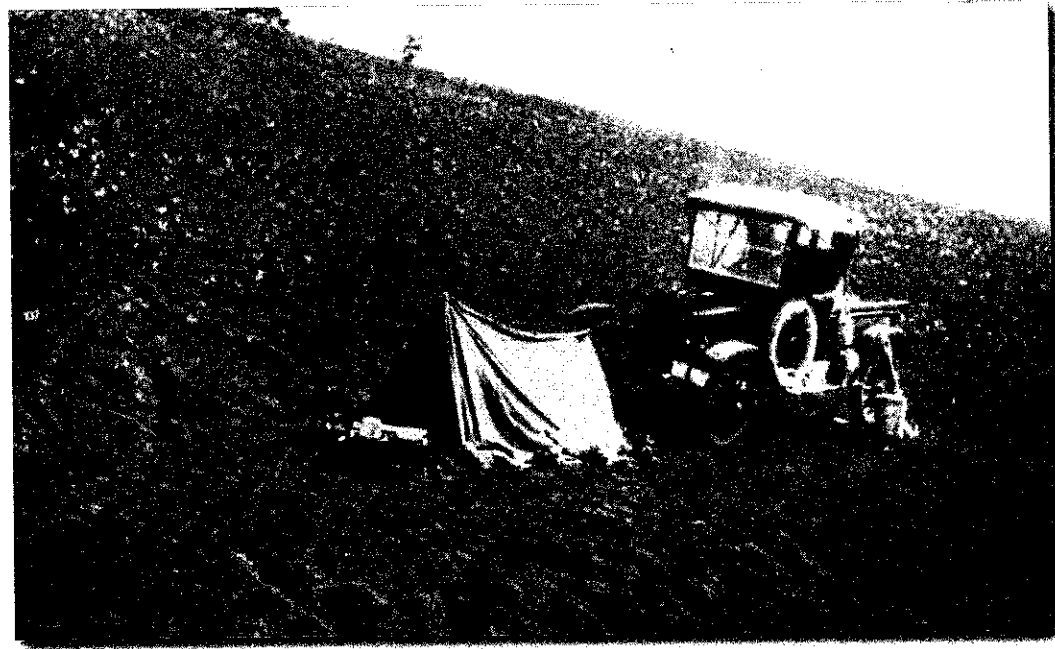
Based on the analysis of archaeological data within the Craters of the Moon National Monument and Preserve, Holocene lava flows clearly need to be considered in any investigation of pre-contact Shoshone settlement and subsistence patterns on the eastern Snake River Plain.

The data indicate that the lava edge was a preferred location whether groups intended to stay overnight or for longer periods. This analysis also suggests that human populations were growing during the late Holocene and that utilization of the lava edge also increased over the past 4,000 years. While the attraction of lava edges may be associated with greater effective moisture, we currently do not have paleoclimatic data that support this hypothesis. Instead, the presence of what appear to be defensive structures at base camp 10BN389 and the inhospitable location of the Lost Lava Rings residential base suggest that the variables responsible for site distribution patterns as well as the character of late

Holocene sites on the eastern Snake River Plain may be more complex than previously predicted. Although the availability of food and water were critical in the cold high desert, our recent discoveries on the Preserve suggest that intercommunity stress associated with late Holocene population pressures may have also greatly influenced where people chose to stay. These intriguing developments will be pursued as part of future investigations on the Craters of the Moon National Monument and Preserve.

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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