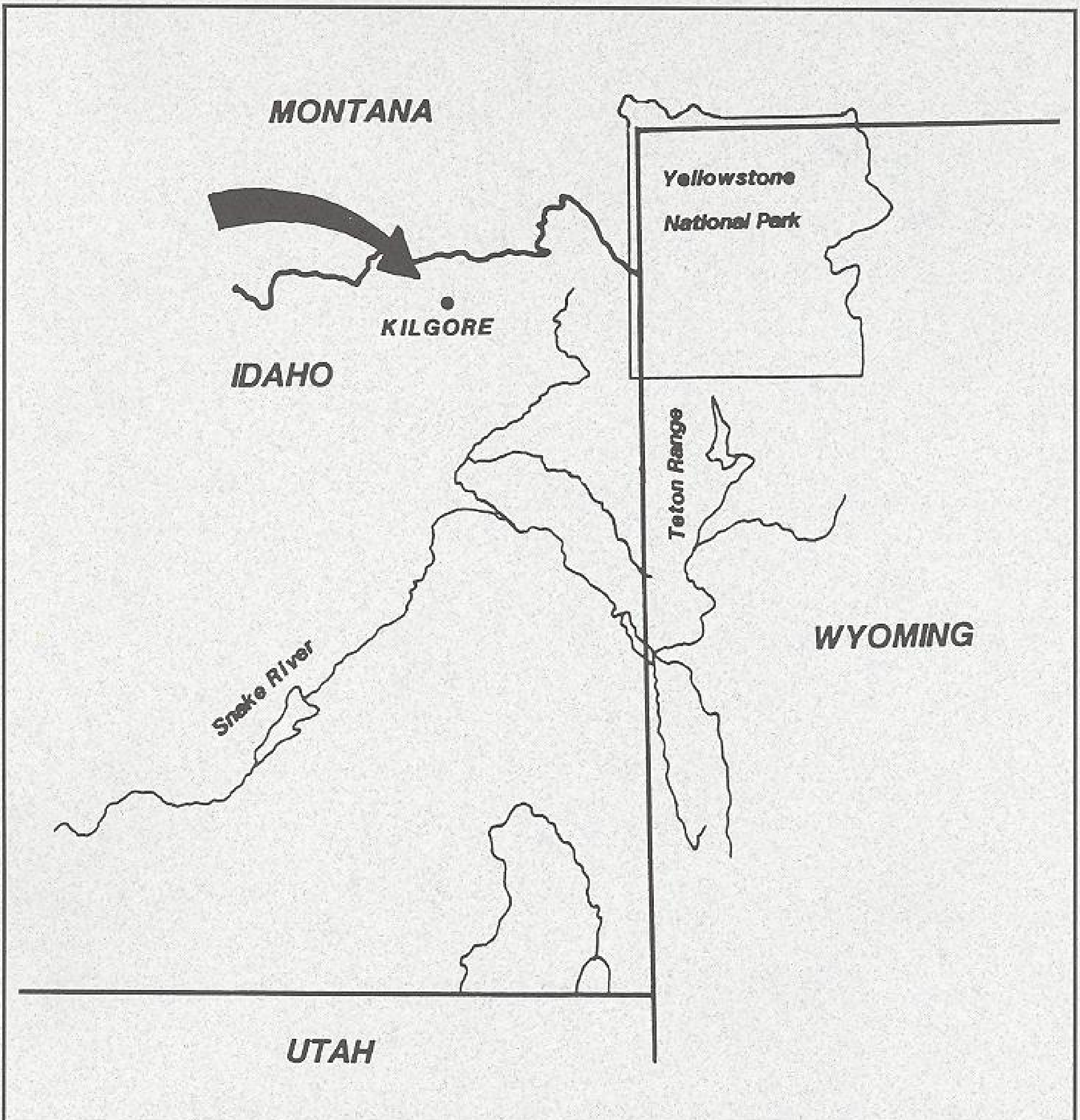
IDAHO ARCHAEOLOGIST

ISSN 0893-2271



Volume 18, Number 1

Volume 18, Number 1
Spring 1995

IDAHO ARCHAEOLOGIST

The ***IDAHO ARCHAEOLOGIST*** is published semi-annually by the Idaho Archaeological Society in cooperation with the College of Social Science and Public Affairs, Boise State University. The ***IDAHO ARCHAEOLOGIST*** is the journal of the Idaho Archaeological Society, a non-profit association of professional and amateur archaeologists, organized under the laws of the State of Idaho. Subscriptions are $12.00 per year and may be obtained by writing the ***IDAHO ARCHAEOLOGIST***, Department of Anthropology, Boise State University, 1910 University Drive, Boise, Idaho 83725.

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Cover: Map showing general location of Big Table Mountain.

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ARTICLES AND REPORTS

BIG TABLE MOUNTAIN: AN OBSIDIAN SOURCE IN THE CENTENNIAL MOUNTAINS OF EASTERN IDAHO.

Charles G. Willingham
Targhee National Forest

INTRODUCTION

Over the last three decades a great deal of interest has been shown in obsidian source identification and the role of obsidian in aboriginal trade. Both x-ray fluorescence of obsidian trace elements for source identification and obsidian hydration for chronological information have been used by investigators to achieve these objectives.

One source which has received considerable mention in source identification literature was referred to initially as Field Museum Yellowstone (F.M.Y. 90 Group) and subsequently as Bear Gulch and Camas-Dry Creek obsidian. Recent investigations in the Centennial Mountains have obtained new information which may be significant to further research on this obsidian source.

The purpose of this paper is to clarify some ambiguity regarding place names as they refer to the locality of this obsidian source, and to provide additional information on its location, archaeological context and implications as an important obsidian source in aboriginal trade. For reasons which will become apparent, this source will here be referred to as the Big Table Mountain obsidian source.

SOURCE LOCATION

Over the past four years, we have attempted to more accurately identify the source outcrops for the Bear Gulch/Camas-Dry Creek obsidian as well as other obsidian and vitrophyre sources within the Targhee National Forest. This investigation led us to refer to the Bear Gulch/Camas-Dry Creek obsidian source as the Big Table Mountain source, located in the Centennial Mountains of eastern Idaho (Figure 1).

Big Table Mountain is a northwest to southeast trending ridge bordered by East Camas Creek on the north and east, West Camas on the southwest, Pete Creek on the west and the Continental Divide on the north. This mountain forms the divide ridge between East and West Camas Creeks and extends to the southeast where it terminates on the edge of the Upper Snake River Plain at Button Butte in the vicinity of Kilgore, Idaho. It is a 762 m high ridge that ranges in elevations from 1,981 m to a maximum elevation of 2,768 m. Vegetation is composed of mixed alpine meadows, Douglas-fir and subalpine fir.

Geologically, Big Table Mountain is formed from Tertiary age volcanics that uplifted during the Pliocene as the Snake River Plain downwarped (Prentiss 1978). Subsequent erosion, glaciation and fluvial deposition resulted in moderately dissected slopes. This slope dissection has exposed several obsidian outcrops which appear as boulder and cobble deposits rather than continuous shield flow beds.

The major obsidian source outcrops are located on the upper southwestern and northeastern slopes of Big Table Mountain. These outcrops were the primary focus of aboriginal obsidian extraction on the mountain and are associated with several large quarry areas and lithic workshops. Two of the largest quarry areas contain numerous quarry pits with debitage backfill over one meter thick. In many cases, quartzite hammerstones used in primary reduction are still in place in backfill piles. Broken biface blanks and large primary and secondary flakes are predominant in artifact assemblages. The source area covers approximately 28 sq km, although source and quarry areas are not contiguous (Figure 2).

The archaeological context of the Big Table Mountain obsidian source is the focal point of an aboriginal settlement pattern that includes quarry areas and lithic workshops in higher elevations associated with larger base camps and special activity sites in the lower valleys. Relatively extensive archaeological survey in this area indicates that the entire archaeological complex encompasses over 300 sites situated in the East and West Camas Creek drainage systems. The entire complex covers an area approximately 210 sq km and contains the highest aboriginal site density in the Centennial Mountains. This type of settlement pattern associated with obsidian exploitation may be similar to other forms of site distribution at other obsidian and vitrophyre sources in the western United States.

PRIOR EFFORTS IN SOURCE IDENTIFICATION

One of the first x-ray fluorescence analyses of Big Table Mountain obsidian was conducted by Charles Nelson of the University of Massachusetts in 1972 (Gallagher 1979: Appendix I). Obsidian and vitrophyre samples submitted for analysis in a study of source loca-

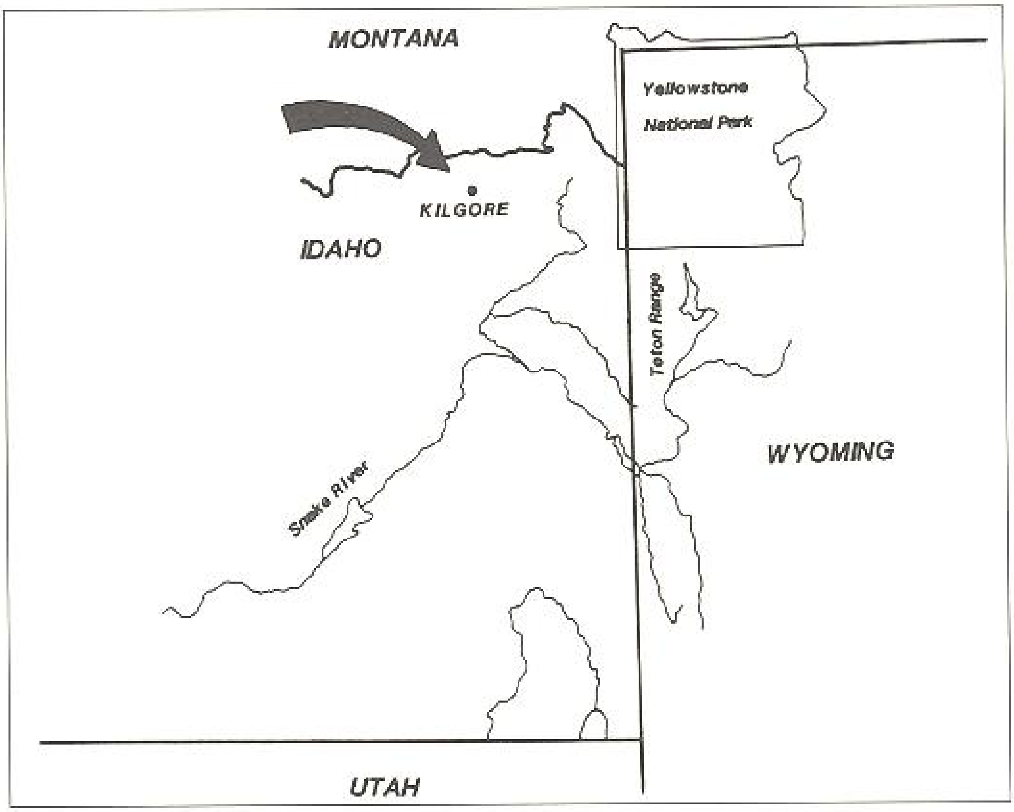

Figure 1. Map showing general location of Big Table Mountain.

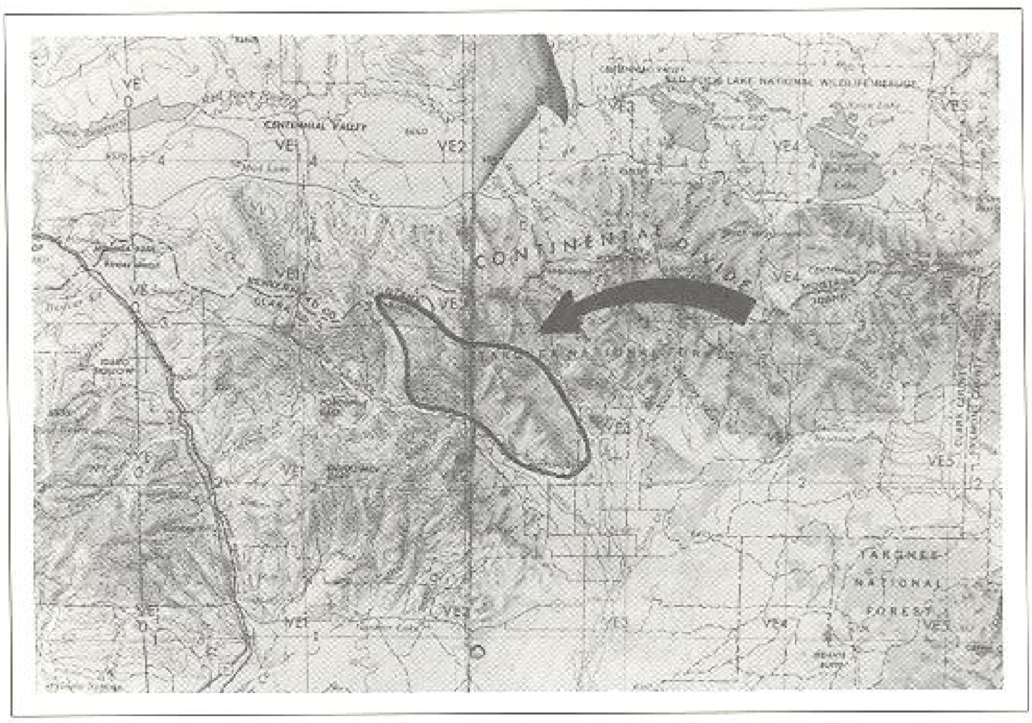

Figure 2. Map showing approximate extent of the Big Table Mountain source.

tions for artifacts at the Sheepeater Battleground and Redfish Overhang sites in Idaho included samples from West Camas Creek and Spring Creek. Both of these locations fall within the boundaries of the Big Table Mountain obsidian source.

The first evidence of Big Table Mountain obsidian appeared in a report by Griffin et.al. (1969). Obsidian specimens from Woodland sites in the midwestern United States identified as 90 Group in Field Museum of Natural History collections were known to be distinct in trace element composition from Obsidian Cliff sources but were believed to be from an unknown source in Yellowstone National Park. Although there was an inherent bias toward Obsidian Cliff as the major obsidian source of the area because of the lack of information on other sources, the search for the location of 90 Group obsidian resulted in a number of later studies.

Davis (1972) found that 90 Group obsidian increased in sites north of Yellowstone National Park as Obsidian Cliff obsidian decreased. Of 145 obsidian specimens examined 32% were from F.M.Y. 90 Group.

Later work by Wright and Chaya (1985) suggested that the 90 Group obsidian was not located within Yellowstone National Park but was instead located outside of the park to the northwest. They suspected that it probably spread north and east around Yellowstone National Park and along the Missouri River.

Additional research of obsidian sources by Anderson et al. (1986) also identified unknown obsidian sources in archaeological sites in Iowa. Of 31 obsidian samples from 19 sites, eight were classified as unknown sources and were referred to as Sources A, B, and C. The Obsidian Cliff quarry in Yellowstone National Park made up 74% of the sample and 19.4% were from Unknown Source A. They concluded that because of the similarity of the trace element composition with the Yellowstone sources, these sources were likely from the Yellowstone area.

Subsequent studies of obsidian samples from a lithic workshop by Hughes and Nelson (1987) identified Unknown Source A as being from Bear Gulch in the Centennial Mountains of eastern Idaho. They correctly surmised that the parent source outcrop for the material had not been located but likely occurred in the Centennial Mountains farther to the north.

The Big Table Mountain obsidian source was more accurately identified by Wright et al. (1986) in their following attempt to locate the origin of the F.M.Y. 90 Group obsidian. They identify its origin as being in the vicinity of West Camas and Dry Creeks in the Centennial Range, Idaho and refer to it as the Camas-Dry Creek source.

Although referred to by different names, the ternary diagrams in source studies by Nelson (1979), Green (1982), Sappington (1982), Nelson (1984), Anderson et al. (1986), and Hughes and Nelson (1987) show similar ranges of strontium, rubidium and zirconium frequencies (Figure 3). This suggests that these samples are from the Big Table Mountain source.

PROBLEMS IN SOURCE IDENTIFICATION

Most of the confusion as to the location of the Big Table Mountain obsidian source is a result of the place names used to identify it. One of the more commonly used names for this source is Bear Gulch. This name was

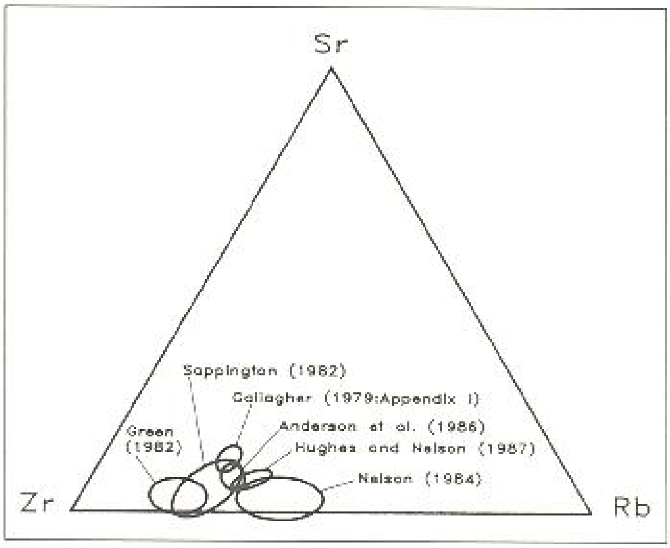

Figure 3. Ternary graph comparing relative frequencies of strontium, rubidium, and zirconium in obsidian sources from the Big Table Mountain vicinity.

initially used by Hughes and Nelson (1987) because their samples were obtained from a lithic workshop in the Bear Gulch area at the base of the Centennial Mountains. While it is accurate that Bear Gulch is located on the southwestern slope of Big Table Mountain, it is actually only a small part of the source area and appears to be a secondary deposit of the major source outcrops. Another widely known Bear Gulch which has been inaccurately mentioned in the literature is located on the Targhee National Forest in the Ashton, Idaho vicinity 60 km to the southeast. No volcanic glass has been identified in this immediate area.

The name Camas-Dry Creek was first used by Wright et al. (1986). This place name is somewhat ambiguous, however, in identifying the 90 Group source. There are two Dry Creeks on the southern slope of the Centennial Mountains and both creeks are located outside of the primary volcanic source of Big Table Mountain. One is located 14.5 km to the east and the other 24 km to the west in the vicinity of Spencer, Idaho. Both Dry Creeks contain varying quantities of vitrophyre associated with a broad vitrophyre flow which occurs along the southern flank of the Centennial Mountains, but neither appears to contain the translucent volcanic glass found in abundance on Big Table Mountain. Only the western Dry Creek contains vitrophyre in sufficient abundance to qualify as a source of aboriginal quarrying activity.

Another perplexity in tracing obsidian samples to the Big Table Mountain source is distinguishing it chemically from other vitrophyre sources on the Targhee National Forest. A number of discontinuous vitrophyre sources have been identified within an "ignimbrite apron" which extends west from the eastern slope of the Beaverhead Range along the Continental Divide to the Moose Creek Plateau, the west slope of the Teton Range, and south to the Caribou Range (Cook 1962). Nelson (1982) conducted x-ray fluorescence analysis on vitrophyre samples from the Moose Creek Plateau and the Big Horn Mountains which lie within this discontinuous flow. His trace element analysis indicates that they are similar in chemical composition.

In neutron activation analysis and atomic absorption spectroscopy of obsidian artifacts by Hatch et al. (1990), trace element values indicated that Camas-Dry Creek was the source of some of their 90 Group. However, they suggested that other samples from this group were from unknown sources. Some of these sources may have their origin in vitrophyre deposits on the Targhee National Forest.

It is suggested that some of the problems associated with source identification of the 90 Group may be resolved by a sampling design to chemically distinguish these vitrophyre sources from the obsidian source at Big Table Mountain. It should be noted, however, that while chemical composition may be similar, many vitrophyre sources on the Targhee National Forest, particularly in the Moose Creek Plateau area, have little value for lithic tool manufacture because of poor quality.

IMPLICATIONS FOR ABORIGINAL TRADE

The role of Big Table Mountain obsidian as an aboriginal trade item is not well understood since sufficient studies of collections on a regional and national basis have not been conducted. It has been identified in a variety of archaeological contexts, however, which suggests that it has been utilized since the Paleoindian Period and may have played an important role in aboriginal obsidian trade on a national scale.

In a study of Paleoindian obsidian use in the Yellowstone area, x-ray fluorescence spectrometry was used to analyze eight Late Paleoindian projectile points from the Yellowstone area (Cannon 1993). Projectile points typed as Hell Gap, Alberta, and a reworked Late Paleoindian point were identified as Bear Gulch obsidian.

X-ray fluorescence analysis of projectile points from the Lawrence Site near Jackson, Wyoming showed that five points were made of Bear Gulch obsidian (Kunselman 1991). Four projectile points were classified as Late Paleoindian and one as Early Plains Archaic. Peterson (1991) identified the Late Paleoindian projectile points as similar to the Cascade type which have a geographical distribution from the Northern Great Basin to the Columbia Plateau. More recent archaeological investigations at the Jackson National Fish Hatchery site (48TE1291) identified Targhee National Forest obsidian as one of five sources represented at the site (Kunselman 1993).

Obsidian likely originating at the Big Table Mountain source was identified in 5 (16.7%) of 30 samples from eastern Wyoming by Frison et al. (1968). It has also been found in Late Paleoindian and Early Archaic contexts at the Lookingbill site (48FR308), a high altitude occupation in the vicinity of Dubois, Wyoming (Larson 1991) and in Early Archaic occupations at the Laddie Creek site in the Bighorn Mountains (Larson 1990). Of 20 samples from Veratic Rockshelter in Birch Creek Valley, Idaho, 11 (55%) were identified as 90 Group (Wright et al. 1969). This is the 90 Group later identified by Wright et al. (1986) as the Camas-Dry Creek source.

Big Table Mountain obsidian has also been identified in Paleoindian, Archaic and Woodland Period sites in the midwestern United States. Griffin et al. (1969) identified 90 Group obsidian at Middle Woodland Hopewell Culture sites in Ohio, Indiana, Illinois, and Wisconsin. It was found in 15.9% of the samples from Hopewell Culture sites. Anderson et al. (1986) identified obsidian which they classified as Unknown Source A from Paleoindian, Archaic and Woodland Period archaeological sites in Iowa. Of 31 samples examined, 19.4% were from Unknown Source A. The three samples taken from Middle Woodland burials all were from Source A. Hatch et al. (1990) identified Big Table Mountain (90 Group) obsidian in Hopewell burial mounds at Seip, Ohio and Naples, Illinois.

Although insufficient source identification studies have been conducted to establish the areal extent of Big Table Mountain obsidian trade through time, the geographical location of this source near the headwaters of the Missouri River is a strategic position from which trade could be conducted in the Mississippi River drainage system. Future research focusing on source identification analyses of obsidian artifacts from various areas of the United States east of the Continental Divide may provide valuable information on aboriginal trade networks and cultural contacts.

SUMMARY AND CONCLUSIONS

Recent investigations suggest that Big Table Mountain is the source of Bear Gulch, Camas-Dry Creek, and 90 Group obsidian. It is also the focus of an aboriginal settlement pattern associated with obsidian exploitation that may have trade implications in the Mississippi River drainage system. Problems in source identification of 90 Group obsidian appear to be related to both place name confusion and inadequate studies to chemically distinguish a discontinuous vitrophyre deposit that extends along the southern flank of the Centennial Mountains and southward to the Caribou Range. Current investigations are focused on the development of a systematic sampling design to establish the range of variation for trace elements at the Big Table Mountain source and to chemically distinguish this obsidian source from other vitrophyre deposits in the area.

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Short Contributions

RESULTS OF IMMUNOLOGICAL ANALYSIS OF TWO PREHISTORIC PESTLES FROM SITE 10AM110, PAYETTE NATIONAL FOREST, IDAHO.

Margaret Newman
Department of Archaeology, University of Calgary
and James Winfrey, Payette National Forest

The Flat Creek Site (10AM110) is a prehistoric Native American activity area consisting of a fairly dense lithic scatter visible in a logging road which runs parallel to Flat Creek on the Payette National Forest (Figure 1). While monitoring the site in 1993, three ground stone artifacts were found eroding out of the road or incorporated into the road's drainage features. The artifacts included two basalt mortars and one basalt pestle. A second basalt pestle was found in a bulldozed fire line not far from the site. These artifacts were collected and returned to the Supervisors Office of the Payette National Forest, McCall, Idaho.

The mortars were produced on large flat basalt boulders with shallow basins pecked and smoothed into the flat surfaces. The largest mortar was found on the road which runs through the site. This mortar has one basin where grinding occurred and weighs in excess of 75 pounds. The second mortar was discovered in a road cut approximately 20 centimeters below the surface. This smaller mortar weighs 43 pounds and is 82 millimeters thick with pecked and smoothed depressions on each

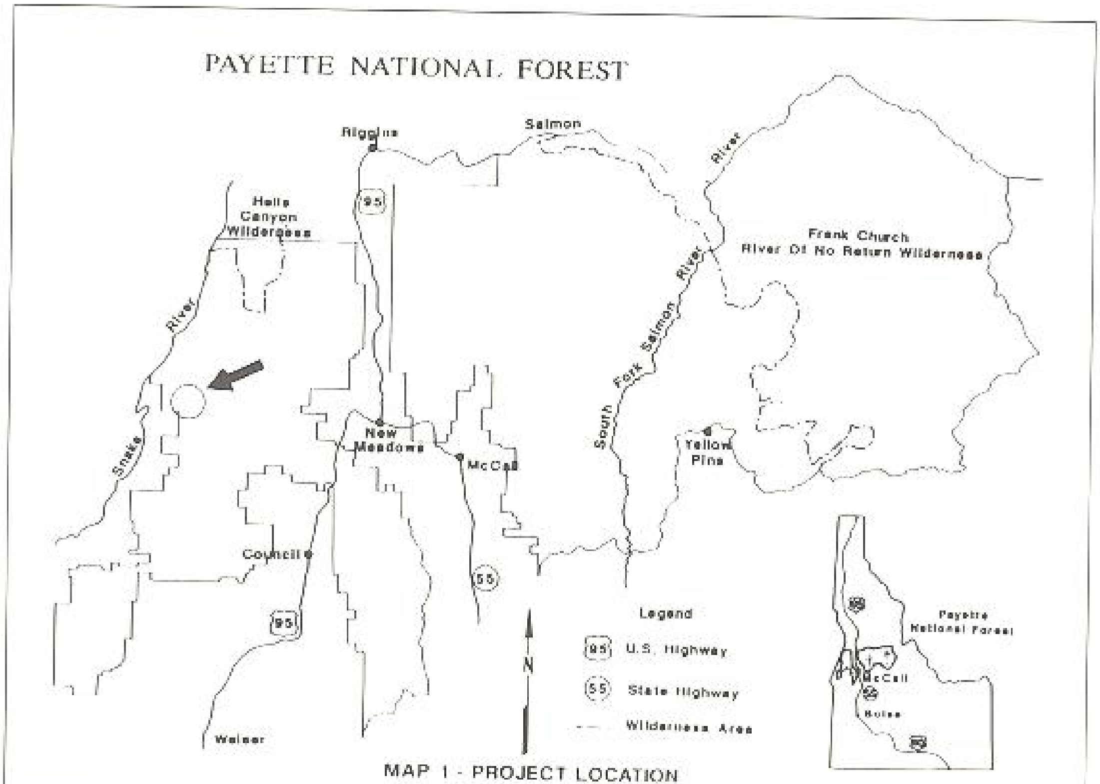

Figure 1. Location of the Flat Creek Site on the Payette National Forest, Idaho.

side. One of the basins is exposed in cross section indicating that the slab of stone had broken. After breaking, the slab of rock was turned over and a new basin was then worked into the opposite surface.

The pestle identified in Figure 2 is of a porous basalt and is conical in shape. It is 118.1 millimeters in length, 61.4 millimeters in width at the large end and tapers to 21.1 millimeters. Both ends have been flattened with use/wear. Several spalls have been removed from the sides during use. The second pestle (Figure 3) is also of a porous basalt and has an overall club shape. The pestle is 260 millimeters long and 87.4 millimeters wide. Both ends exhibit much shaping and battering.

In an attempt to ascertain the range of function of the pestles with respect to food processing the two specimens were sent to Margaret Newman at the Laboratory of Archaeological Science, California State University, Bakersfield, for immunological analysis. It was thought that immunological analysis of these two artifacts might provide more specific subsistence information regarding these tools and the function of this site. Immunological analysis has been proven to be a reliable means of determining the presence of blood residues on archaeological materials (Newman 1990, 1993; Yohe et al 1991; Brieur 1976).

The presence of protein residue on flaked and ground stone tools indicates the use of these tools to process animal and/or plant resources for consumption or other uses. Yohe et al. (1991:663) demonstrated the association between the presence of protein residues on ground stone implements and ethnographic accounts from California of the crushing and pulverizing of small mammal parts for consumption. The analysis of a ground stone artifact from a site in Yellowstone National Park indicated the use of that tool to process a species of the deer family (Cervidae) (Newman 1990).

Newman (1993) used cross-over electrophoresis (CIEP) to analyze the two pestles from 10AM110. This test has a long history in medico-legal work and is used to identify possible blood and other stains in forensic laboratories (Yohe et al. 1991). The procedure is discussed fully in Newman and Julig (1989).

A 5% solution of ammonium hydroxide was used to remove possible residues from the pestles. This has been shown to be the most effective extractant for old and denatured bloodstains and does not interfere with subsequent testing (Dorrill and Whitehead 1979; Kind and Cleevely 1969). The samples were first tested against preimmune serum (i.e., serum from a non-immunized animal). A positive result against this serum could arise from nonspecific protein interaction not based on the immunological specificity of the antibody (i.e., nonspecific precipitation). No positive results were obtained. Testing was continued against the following antisera: bear, bovine, cat, chicken, deer, dog, guinea-pig, mouse, rabbit, sheep, elk, pronghorn, and trout.

One pestle (Figure 2) elicited a positive reaction to rabbit antiserum. Positive results to this antiserum are obtained with all members of the order Lagomorpha (rabbits, hares, and pikas) but not with other orders (Newman 1993).

The other pestle (Figure 3) had no positive reactions to the antisera used in this test. These results can be explained in at least three ways. First, proteins on the pestle were subjected to weathering and not preserved. Second, there are proteins on the pestle, but they belong to a species not included in these tests. Third, the pestle was used to process only plant resources.

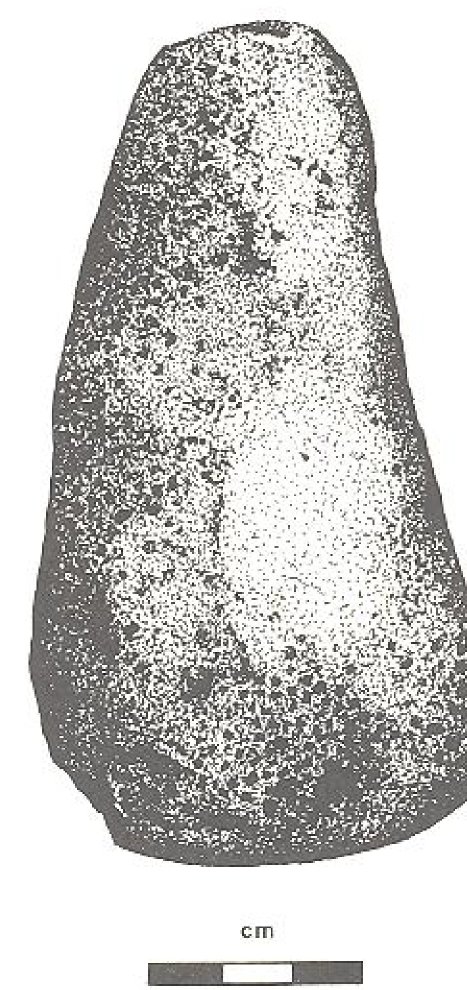

Figure 2. Pestle number one. This pestle elicited a positive reaction to rabbit antiserum. Positive results to this antiserum are obtained from all members of the order Lagomorpha (rabbits, hares, and pikas). Illustrated by Koni Fujiwara.

The site that the pestles were collected from is located at approximately 1428 meters above sea level along a major migration route out of the Snake River Canyon. The site had originally been considered to be a short term camp along this travel route. At that time, no large or diagnostic artifacts were identified at the site. While no diagnostic artifacts have been found at 10AM110 there is a large collection of diagnostic material from sites in the immediate area. Using the typology for the Lower Snake River developed by Leonhardy and Rice (1970) and the types of projectile points found on sites neighboring 10AM110 it is believed that 10AM110 could range in age from 6000 B.C. to A.D. 1700.

This site, and others in the area, were recorded during inventory work conducted in 1980 (Arnold 1980). At that time it was thought to be a transitory site between the

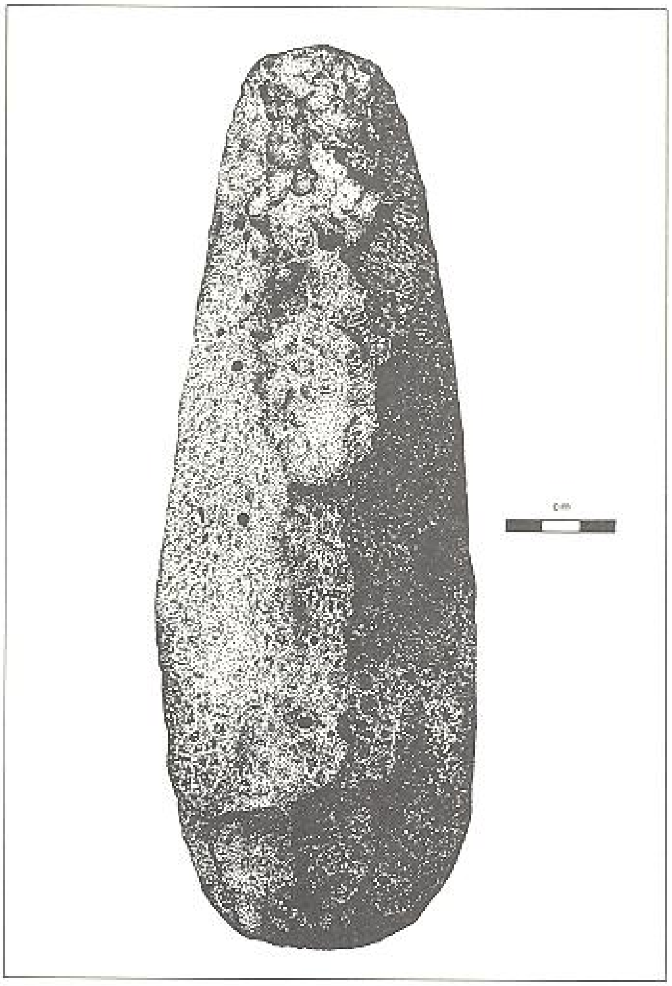

Figure 3. Pestle number two. This pestle did not elicit positive reactions to any of the antiserum used in this test. Illustrated by Koni Fujiwara.

Snake River trench and the uplands (Arnold 1980). Little attention was paid to the site until the monitoring visit in 1993 when the ground stone implements were found. When the site was visited during the early summer of 1993 an abundance of Arrowleaf balsamroot (Balsamorhiza sagittata), onions (Alium sp.), and Camas (Camassiaa quamash) was noted in the area. With the location of the ground stone implements and the abundance of plant food resources in the area, the idea that the site was simply a short-term expedient camp along a travel route was reconsidered.

Additional evidence suggesting a major location for the procurement of resources comes from the number of large sites in the vicinity of 10AM110 with similar artifact assemblages. At one site, ten pestles and a large collection of Piqunin Phase and Harder Phase projectile points were collected. Another site produced more ground stone tools and a small collection of Northern side-notched projectile points. The diversity and frequency of both hunting and processing tools suggests a longer term occupation in the area, possibly on a seasonal basis. The time depth represented by the projectile point typology suggests a long history of the use of this area as well.

The results of the immunological analysis indicate that large mammals were not the only source of animal protein hunted or consumed at the site. It also shows that the processing of plant resources was not the only use to which ground stone tools were applied. More work could be conducted in the Flat Creek drainage to determine the activity level of prehistoric people in the area. Pollen phytolith and/or immunological analysis of the ground stone tools may provide further information concerning which plants were being processed at the site. Antisera to a number of plants such as camas, pinon, and acorn are presently being raised at the University of Calgary. Future testing of ground stone using immunological analysis with these antisera may reveal the type of plants utilized. Immunological analysis of projectile points may reveal the types of large game being hunted. More inventory with the addition of test excavations in the area might provide a better understanding of the spatial relationship between sites and better chronologic understanding of the different periods during which this area was used.

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