**Bulldozing for Bifaces: Production, Procurement, and Provenance Analysis of an Obsidian Biface Cache from the Central Cascades of Oregon**

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Abstract
Obsidian Cliffs, in the Three Sisters Wilderness Area of Oregon, was a major obsidian source within the homeland of the Molala. We consider the distribution of lithic scatter sites along trail systems, and the long-distance and intra-regional exchange system that extended into other cultural areas. The nature of the lithic technology at the quarry, and the variability of artifacts at near and distant sites helps us to understand how various artifact types are represented at sites and the regional technologies of western Oregon. We show how obsidian sourcing enriches our understanding of long distance exchange and cultural affiliation.

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Our interest in provenance analysis grew out of the discovery of a biface cache in the upper reaches of the Santiam drainage. Archaeological research in the Western Oregon has not, until the advent of vigorous historic preservation legislation, been the focus of extensive systematic research. Early work had a distinct bias towards rock shelter sites (e.g. Newman 1966; Olsen 1975) or the valley Kalapuya mounds ( Mackey 1974) with little interest in"open-air" lithic scatters. Data derived from lithic scatter sites and rock shelters in the Western Oregon are difficult to place within existing chronological and explanatory frameworks for several reasons. The Cascade Mountains lie at the interface of several major culture areas or subareas (the Great Basin, the Columbia Plateau, and the Willamette Valley) and this area may have been utilized by a diversity of prehistoric groups. Chronology, group origins and cultural affiliations of prehistoric sites are thus poorly understood. In this paper we will use the distribution of Obsidian Cliffs material from the quarry/workshops of the Cascades to sites along known historic trails in the Cascades, across the Willamette Valley to the foothills of the Cascades. Restricted by limited funding, the selection of artifacts for sourcing considers lithic technology associated with production of flakes from bifaces to show a strong cultural association between groups, which may have existed for thousands of years.

This discovery of eight bifaces during fire suppression activities in June 1991 resulted in the recovery of a cache as site 35LIN542 (Paul's Fire Cache). We began to look at the implications of Paul's Fire cache to our understanding of transportation and lithic production activities in conjunction with sourcing. The cache had been partially disturbed during logging activities, but the had remained hidden due to the extensive logging slash that covered the area. A trail of bifaces lead directly into a cut bank formed by the skid trail. Excavations into the cutback revealed 14 bifaces in situ within an earthen filled pit approximately 70 cm below the surface. We were looking at a biface cache that dated to 4075$\pm$ 55 years BP (reference number AA-9773) and with hydration measurements 2.3 or 2.4 microns $\pm$ 0.1 microns. Trace element analysis identified this source as Obsidian Cliffs.

The 33 recovered whole bifaces and the four additional re-fitted bifaces are summarized below. The bifaces were produced by percussion flaking. They reflected large early to middle stage bifaces produced by percussion flaking. It appears that only a minimum number of flakes were removed from each biface. The bifaces were characterized by arris wear along much of the surface. This may be the result of transport, although on hinge factors it may have been part of the reduction strategy.

| Attribute | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Length (mm) | 131.24 | 12.62 | 101.5 | 167.0 |
| Width (mm) | 70.73 | 7.52 | 52.5 | 82.0 |
| Thickness (mm) | 17.29 | 12.76 | 10.5 | 24.3 |
| Weight (grams) | 158.64 | 32.52 | 75.0 | 226.8 |

Table 1: Summary of Descriptive Statistics for the Biface Cache.

This cache was found within the homeland of the Molala. The seasonal round pattern of the Molala provided a lifestyle that focused on the floral and faunal resources at the small prairies found in the Western Cascades. Winter occupation was in multiple family pit house villages. In the spring these groups broke into nuclear families that exploited the migratory deer and elk as well as available plant resources as they moved to the upper elevations (Topel and Beckham 1983).

The Molala evidently made use of their location to develop and exploit trade routes. An elaborate system of aboriginal trails within the Western Cascades linked to regional prehistoric travel routes attests to the importance of trade networks (Winkler 1984). The Molala were known to have traded upland resources at Willamette Falls with the Kalapuya for camas cakes (Zenk 1976) and the Klamath for pond lily seeds and beads (Jensen 1970). Winthrop and Gray (1985) noted that the lithic assemblages in association with an historic trail, and probably an aboriginal trail, suggests that the Molala habitation of the Western Cascades provided them with accessible trade routes to the west, north and east. Thus many upland sites may relate to prehistoric trade routes and not just resource procurement. Churchill and Jenkins (1991) suggest that approximately 80% of the recorded sites on the Battle Ax and Brientbush USGS quads (, are within ½ mile of trails. In comparing tested trail associated sites that are on ridges or saddles, they suggest these sites are seasonally occupied and located on travel routes. Analysis of this biface collection (with funding provided by the Region 6 of the Forest Service) led us to the quarry site, Obsidian Cliffs, also within the

Molala homeland.

Obsidian Cliffs, extends 70 to 90 meters in elevation, and is a 2.4 km-long glaciated obsidian-rhyolite flow that originates at the western base of North Sister Volcano. The cliffs and plateau above them is accessible by trails (Skinner 1983). Much of the Obsidian Cliffs flow consists of pale gray rhyolite intermixed with glassy black, gray-black, and occasionally red obsidian. Spherulites and lithophysal banding are common at the flow, although they are rarely seen in artifacts correlated with the source. Located at 1828m (6000 ft) above sea level obsidian Cliffs is usually only accessible from June to October. The Pleistocene glacier that swept over the flow extended westward down the Lost Creek Valley to the McKenzie River. Obsidian nodules are now found on the floor of the Lost Creek Valley, in at least one adjacent valley, and in glacial till deposits near the town of McKenzie Bridge (Skinner 1986; Taylor 1968:15). Obsidian Cliffs glass is also present as small nodules in the gravels of the McKenzie and Willamette Rivers in the Willamette Valley (Skinner 1986; White 1974:220, 1975:171).

The geologic age of this flow is K-Ar age of 95 +/- 10 ka is reported by Hill 1992:19.

Obsidian artifact manufacturing debris covers much of the Obsidian Cliffs plateau and it is clear that this source was widely used throughout much of the post-glacial period. Characterized glass from this source has been found at many archaeological sites in both western Oregon, central Oregon, and north central Oregon (Hughes 1992a; Skinner 1995:4.20-4.36; Skinner and Winkler 1991, 1994). Obsidian source use in the Willamette Valley is dominated by the Obsidian Cliffs and Inman chemical types (Wilson 1995). Obsidian Cliffs artifacts have also been reported from Washington (Hughes 1992b), and from as far north as British Columbia, Canada (Carlson 1994).

At Obsidian Cliffs the Forest Service had identified 21 quarry sites of the 37 archaeological sites identified. A model based on qualitative impressions, suggested obsidian was removed and reduction took place elsewhere, away from the Cliffs. It was very obvious to us that procurement of obsidian had taken place at the Cliffs. Hammerstones in abundance were noted as we ascended the cliffs. Hammerstone raw material of mafic andesite, andesite and tuff was available on the plateau. Hammerstones were exhausted

to the point that they were rounded. To examine reduction sequences 50 cm by 50 cm study plots were established and all diagnostic debitage was examined and assigned a size range.

**Blocky chunk**- angular pieces of stone with a natural fracture surface which resembles negative flake scars and remnant ventral surfaces

**Earlycore/early biface-flakes** with thick blocky platforms, thick cross sections, relatively simple dorsal scars resembling early block like flakes from blocky chunks. Early core and early biface are distinguished by platform characteristics. The core flakes are characterized by single facet platforms and the early bifaces are characterized by multifaceted platforms.

**Middle Stage biface**- Flakes characterized by single and/or multifaceted platforms. The flakes are broad and thin with complex dorsal scars suggesting removal of flakes from different angles (probably from the early shaping of a bifacial core into a relatively symmetrical biface). Flakes are thick and flat to curved in longitudinal section.

**Late Stage biface**- Flakes characterized by multifaceted platforms, thin expanding with complex dorsal scars. These flakes are flat to curved in longitudinal section.

We realized that Paul's Fire cache, representing a single depositional event. We began to examine the sites we had identified. Along the Old Cascades Crest Trail, although there has been no sourcing it is was apparent that flakes had been produced off of bifaces and the presence of the historic trail and proximity to the cache location helped re-enforce our interpretation of this as an aboriginal trade route and new insights into the long-distance movement of obsidian (Rogers and Linderman nd).

The site 35LIN357, Jan Can Too, is also located along a ridge separating the South Santiam River and Canyon Creek. This undisturbed open air lithic scatter has the tread of an old historic trail crossing it and over grown blazes were visible when the site was recorded. This site is located along the primary travel

way from the Central Cascades to the Willamette Valley. Located possible in the area between/shared by the Kalapuya and Molala, cultural affiliations begin to blur. The sourcing of pieces of obsidian were all Obsidian Cliffs, with the exception of 2 pieces from Devils Point, an obsidian source which was little exploited (It is a smaller source usually utilized locally (Skinner 1997) and it probably did not have the social interaction of Obsidian Cliffs .) A radio carbon date of 7520 ± 150 BP from a hearth feature provided another example of the time depth associated with Obsidian Cliffs. Although we have no range of radio carbon dates, hydration measurements on the Obsidian Cliffs material range from 1.1 to 3.5 microns, with the hearth associated and with measurements of 3.1 and 3.2 microns. Reflecting back on this site it became clear that the reduction sequences we were seeing reflected the reduction of bifaces.

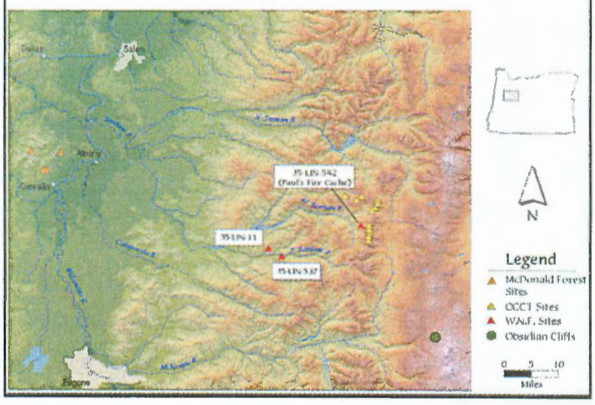
As we moved across the Willamette Valley, out of the Cascades and into what was ethnographically recognized as the homeland of the Kalapuya. The Willamette Valley is a broad structural depression oriented north-south and situated between the Coast Ranges to the west and the Cascade Range on the east (Franklin and Dryness 1984: 15). The name Kalapuya is applied to the people who spoke Kalapuyan languages, a Penutian phylum (Zenk 1990:547). The Kalapuya occupied the Willamette Valley, up to the crest of the Coast Range and into the foothills of the Cascades. Ethnographic and ethnohistoric accounts describe the Kalapuya as having occupied winter villages, and occupying more temporary sites during the rest of the year. They followed a series of seasonal rounds as part of their subsistence, economic and social activities. Purposeful and regular burning of the valley areas produced a landscape that favored the economically important plant and animal species. Subsistence is traditionally described as based mostly on plant foods, primarily camas, acorns, filberts, tarweed and other seeds and roots were used. Burning helped enhance these communities as well as opening areas up for the big game. Exchange at large trading fairs at Willamette Falls were noted to have taken place with the Kalapuya bringing camas cakes to trade. The McDonald Dunn Forest was home to members of the Lukiamute band and the Mary's River band of the Kalapuya. The limited research conducted in the area has shown Kalapuya sites to be associated with the curation of obsidian and the disposability of other lithic raw materials, primarily the cryptocrystallline silicates. In retrospect, it became apparent that the technological history involved in selecting obsidian for sourcing might provide different information from the visual sorting. By looking at the

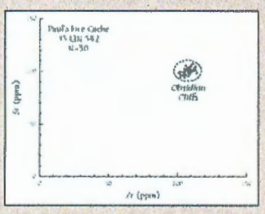
technology and examining the likelihood of it being produced off of a biface, similar to Paul's Fire cache, we were able to identify a wider variety of obsidian sources beyond the most common Inman Gravels. These gravels washed out of the Cascades and are usually reduced with bipolar techniques. Obsidian Cliffs has now been identified for four of the five excavated sites on McDonald-Dunn Forest. Four of the five sites tested on McDonald Dunn Forest have had material sourced to Obsidian Cliffs. Limited to sourcing only a small percentage of artifacts per site due to lack of funding, and where obsidian makes up 40 to 60% of the artifact assemblage, we acknowledge sample size problems. At 35BE 64(n=41) and 35BE65 (n=22), with hydration measurements of 1.3 to 1.8 microns, for 3 pieces of Obsidian Cliffs material, we realize that the technology suggests manufacturing off of bifaces and curation. At 35BE34, a large site associated with camas ovens 2 of the 12 pieces chosen for hydration and sourcing were from obsidian Cliffs. Only one piece was measured with a hydration measurement of 2.6 microns. Alternatively 35BE49 with 1 out of 24 being sourced to Obsidian Cliffs, had a hydration measurement of 1.4 microns.

While this talk has focused on obsidian procurement, trails are the links to how activities- hunting, berry gathering, vision quests and obsidian procurement- are organized on a landscape. These trails may or may not be visible in the archaeological record. These components are all, however, part of an interlocking system of resource exploitation.

This type of spatial organization has largely been overlooked by the focus upon "sites" and their material objects, the lack of understanding of the cultural system of the people who occupied the areas and the difficulty of working in a forested environment. With the use of obsidian sourcing, the links between the places, focusing on how the Molala interacted and the distribution of obsidian sources they controlled required the skills of people who could make and produce the bifaces that are reflected
One must expand their horizon beyond the concept of site and the associated lithics and other material debris to understand the aggregate patterning of these resources as well as berry fields and vision quest localities and as these were linked by trails and thus how the landscape was utilized in order to fully evaluate the area of potential impact linked to key variables of location, resource base and vegetation.

# Bulldozing for Bifaces




X-ray fluorescence trace element analysis
Of the biface cache.

Two of the "typical" bifaces

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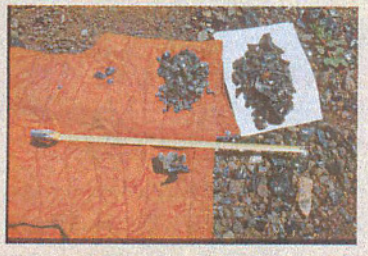
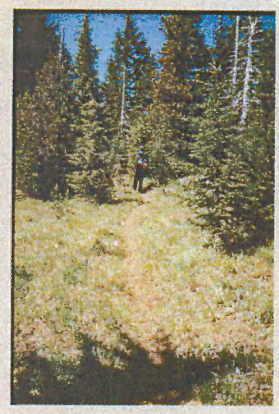


Reduction sequences Plot 7: pressure flake; late biface; middle biface; early core biface; blocky chunks




Sample of lithic material from Obsidian Cliffs demonstrates production from bifaces

McDonald/Dunn Forest located at the western edge of the Willamette Valley

35BE64

35BE65