# CHAPTER 12

## Glass Buttes, Oregon: 14,000 Years of Continuous Use

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For at least fourteen millennia Glass Buttes, one of the largest obsidian sources in Oregon, has been a source of high quality toolstone for Native American flintknappers. In the last century non-native historic and modern flintknappers as well as rock hounds have also used this resource for its abundant, colorful and high quality obsidian. This paper will discuss the quantity and quality of Glass Buttes obsidian, archaeological work that has been done there, the prehistoric and modern use of the resource, new archaeological findings, and the Bureau of Land Management protection plan for this valuable resource.

Obsidian was a commodity and trade item used extensively by Native American and First Nations people of North America. In the United States, the state of Oregon has in excess of 100 geochemical obsidian sources, more than anywhere else on the continent (Northwest Research Obsidian Studies Laboratory 2012) (Figure 12-1). The ancient use of these obsidian resources has added to a rich archaeological record throughout Oregon, the Pacific Northwest and Great Basin. Over the last thirty years, the use of x-ray fluorescence (XRF) characterization methods has enabled researchers to understand the movement of obsidian tools and toolstone across the landscape (Skinner 1983; Hughes 1983; Carlson 1994). Blood residue extraction, another recently developed technique (Neuman 1990; Williams 1990; Fagan 2011), aids research in understanding game hunting strategies used by ancient hunters and how they have changed over time. The Glass Buttes Source Complex, with


**Figure 12-1. Oregon obsidian sources with Glass Buttes Source Complex circled.**

its nine geochemical varieties identified by Craig Skinner (Ambroz et al. 2001; Northwest Research Obsidian Studies Laboratory 2012), is one of, if not the largest obsidian source in Oregon (Figures 12-2 and 12-3). Glass Buttes has a rich archaeological record that has provided, using XRF and blood residue extraction, new information to our understanding of this very important resource.

Glass Buttes lies within the ethnographic range of the Northern Paiute people and was an important resource for Native People for thousands of years (Mack 1975; Loy 2001; Lebow 1990). Due to its abundant high quality and often-colorful obsidian, Glass Buttes is still used today as a toolstone source by modern flintknappers as well as a material

*Toolstone Geography of the Pacific Northwest*
*Edited by Terry L. Ozbun and Ron L. Adams, pp. 193-207*
*Archaeology Press, Simon Fraser University, 2015*

source for geologists and rock hounds. Modern use of Glass Buttes has impacted this important resource but it continues to be highly significant as a subject of geological and archaeological research as well as a Mecca for rock hounds and practitioners of traditional arts and technologies.

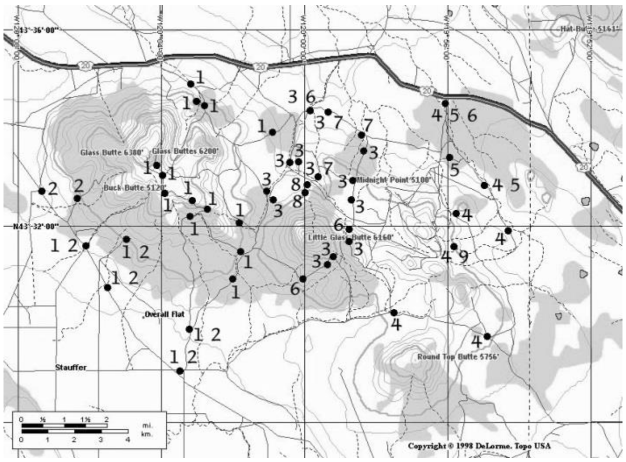


**Figure 12-2. Glass Buttes main geochemical varieties 1-9 source locations.**

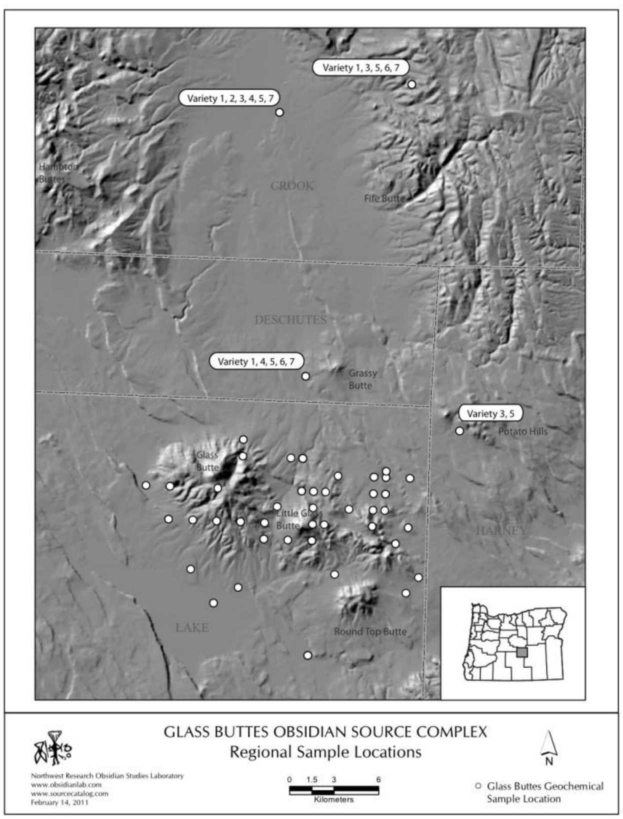


**Figure 12-3. Glass Buttes extended geochemical obsidian source variety locations.**

**Geologic Setting**

Glass Buttes is located primarily in south-central Oregon's Lake County, along U.S. Route 20 between the cities of Bend and Burns. It is situated in the High Lava Plains, on the northern edge of the Great Basin, and is in the Bureau of Land Management (BLM) Prineville District (Figure 12-1). Five million year old Glass Buttes, a large rhyolitic volcanic center, is generally between 900 m to more than 1800 m in elevation and is dominated by Little Glass Butte, and Glass Butte at 1945 m elevation (Mack 1975; Churchill 1991:1; Orr et al. 1992; Loy 2001). Ancient lakebeds, lava ridges, cinder cones, and intermittent springs typify the area (Mack 1975). Obsidian at Glass Buttes is found in an area of approximately 746 km² (Northwest Research Obsidian Studies Laboratory 2012), and occurs as surface float pebbles and cobbles and primary geologic sub-surface veins (Skinner 1983; Churchill 1991:1). This obsidian occurs in a variety of colors including: translucent and banded black, red, mahogany, gold sheen, silver sheen, gray-green banded, rainbow and banded or mottled multi-color combinations (Skinner 1983). Sub-surface obsidian in some areas is available in very large blocks or boulders, some weighing 45 kg or more (Figure 12-4).

**Figure 12-4. Large quarried obsidian.**

Geochemical studies of source obsidian by Ambroz (1997), Ambroz et al. (2001), and Northwest Research Obsidian Studies Laboratory (unpublished research, 2012) has identified nine geochemical varieties at a number of primary and secondary source locations within the Glass Buttes Complex and in the basins to the north and south of Glass Buttes. These sources are found primarily in northeast Lake County (Figure 12-2), with Glass Buttes geochemical varieties 1, 2, 3, 4, 5, 6 and 7 occurring in two locales in southeast Crook County, geochemical varieties 1, 4, 5, 6 and 7 occurring in southeast Deschutes County, and geochemical varieties 3 and 7 occurring in northwest Harney County (Figure 12-3).

### Mining and Geothermal Exploration

Glass Buttes is within an area geologically mapped for its mercury mining and geothermal exploration potential (Johnson and Ciancanelli 1984; Loy 2001). Mercury mining, perlite mining evaluation and geothermal exploration have taken place in the Glass Buttes area. The Oregon Department of Environmental Quality (DEQ) reports that mercury-bearing cinnabar was first discovered at Glass Buttes in 1933, and small-scale mining and exploration was carried out until 1957. From 1957 through 1970, the Jackson Mountain Mining Company conducted larger mining operations, producing 500 flasks of mercury between 1967 and 1970 (Oregon Department of Environmental Quality 2012). Remnants of the mining operations and tailing piles can still be seen to the east of Glass Buttes, but these areas should be avoided as mercury contamination in the mining areas renders them unsafe to visit. These areas were slated by the DEQ for environmental cleanup in 2001, but action has yet to be undertaken by the BLM (Oregon Department of Environmental Quality 2012).

According to the University of Nevada Reno's Great Basin Center for Geothermal Research, Magma Energy was the first company to explore Glass Buttes for its geothermal potential. "Exploration activity in and around Magma's 3607 ha (8,914 acre) property (lease at Glass Buttes) began in 1974 and continued through the early 1980's. Work included numerous drilled temperature gradient holes, geologic mapping, an electrical resistivity survey and a soil-mercury survey. Initial work was sponsored by the Oregon Department of Geology and Mineral Industries and later by the geothermal lease holders Vulcan Geothermal Group and Phillips." (Great Basin Center for Geothermal Energy 2012).

In 1975, Mack conducted a cultural resources inventory for the BLM (Mack 1975). A geothermal plant has not yet been built at Glass Buttes. However, in 2010 ORMAT Nevada conducted further geothermal exploration adjacent to Magma's Glass Buttes project with a $4.5 million dollar grant from the U.S. Department of Energy (Great Basin Center for Geothermal Energy 2012). At the time of this writing no further information on the ORMAT geothermal project was available.

The Supreme Perlite Mining Company laid mining claims within the Glass Buttes area in 1988. Between 1988 and 1989, four test pits were excavated and exploratory drilling took place within a 40-acre designated area, south of U.S. Route 20 and east of Glass Butte. In 1990 a cultural resource survey was conducted by Churchill (1991). Subsequent development for perlite mining has not been undertaken (Supreme Perlite Mining Company, personal communication 2012).

In the mid-1960s a single, private obsidian-mining claim was established at Glass Buttes. Several individuals have held the "grandfathered" claim since the claim was made, and is still in effect to date.

### Previous Research

A number of archaeological projects have taken place in the Glass Buttes area (Mack 1975; Crowley-Thomas 1983a. b; Griffin and Soper 1984; Soper and Griffin 1984; Enneberg 1987; Churchill and Jenkins 1989; Churchill 1991; Sharp et al. 1998; Skinner and Thatcher 2003; Jenkins 2005; Jenkins and Connolly 2006). The four largest archaeological projects of the Glass Buttes area are surveys by Mack (1975) and Churchill (1991), obsidian studies carried out as part of the FGV Western Fiber Build Project (Skinner and Thatcher 2003; Sharp et al. 1998), and the Jenkins and Connolly (2006) testing and evaluation project.

Churchill's survey, conducted in 1990, covered 480 acres for the Supreme Perlite Mining Company's proposed mine, as previously discussed. Churchill (1991) recorded 14 archaeological sites and two isolated artifact finds. The 14 archaeological sites contained a number of bifaces, unifaces, cores, and a hammerstone. Of the two isolate finds, one is a projectile point fragment that resembles an Elko Eared series point; the other is a biface (Churchill 1991:2:1-4).

Jenkins and Connolly's 2006 testing and evaluation project, was conducted under an Oregon Department of Transportation contract for the FTV Western Fiber Build Project, a fiber optics communications line survey paralleling U.S. Route 20. Work included excavation of 197 test probes and three 1-x-1-m test units at five sites. Four of the sites were small lithic scatters, but the fifth was a huge 800-x-200-m area of dense and discreet chipping stations containing thousands of flakes, early stage biface fragments and 40-60 cm deep deposits. Early stage reduction of quarry blanks and flake "rough outs" were the major activities at all five sites using locally obtained obsidian cobbles of Glass Buttes varieties 1 and 2. Obsidian XRF sourcing of 74 specimens that included six tools, an unmodified cobble, and 67 flakes, indicated most were derived from Glass Buttes varieties 1, 2 and 3. Two of the specimens, both bifaces, were made of Silver Lake/Sycan Marsh and Brooks Canyon obsidian. The Silver Lake/Sycan Marsh obsidian source is located about 95 km to the southwest, and the Brooks Canyon obsidian source is located 11 km west of Glass Buttes. The only specimen recovered with chronologically diagnostic attributes, was an Elko Corner-notched projectile point base fragment made of Glass Buttes 1 obsidian. Although no radiocarbon dates were obtained, obsidian hydration analysis of 100 samples of obsidian suggests that these sites were used over a long period of time, extending from a few hundred years ago and back several thousand years into the terminal Pleistocene (Jenkins and Connolly 2006: 57-62). The scope of this project, including subsurface testing and obsidian characterization and hydration analysis, makes it one of the more comprehensive projects that have been conducted at Glass Buttes to date.

Mack (1975) conducted the largest survey of the Glass Buttes area to date under a contract with the Bureau of Land Management for proposed geothermal leasing, as previously discussed. Covering a 30-square-kilometer area around Glass Buttes, the survey identified and documented 131 archaeological sites and 15 isolated artifact finds. Mack describes the archaeological sites as campsites, large and small knapping stations, hunting blinds, rock walls and quarries (Mack 1975:7; Churchill 1991:1:8). Projectile point types recovered during this survey range in age from approximately 13,000 B.P. to 900 B.P. based on standard chronological assignment of the types and indicate continuous human use of the area for that period (Mack 1975:46). These projectile point types as listed by Mack include: a fluted Clovis point, Western Stemmed and foliate points, Northern Side-Notched, Pinto, Humboldt, Elko, and Rose Spring series points (Mack 1975: 78-84).

## Re-Evalution of Artifacts From the 1975 Mack Survey

In 1975, Mack collected and identified 77 tools that include 48 projectile points, one crescent, three drills, one graver, seven scrapers, five stemmed knives, eight bifacial knives, and four unifacial knives. Seventy-three are made from obsidian or fine grain volcanic material (FGV), and four are made from cryptocrystalline silicate material (CCS). At the time of the 1975 Mack survey XRF geochemical sourcing of obsidian was in its infancy and was not a consideration. Blood residue extraction and analysis from stone tools was also in its early stages and not readily available to researchers. Both of these research tools are now commonly used for archaeological analysis.

In 2011, analysis was conducted on 41 of the obsidian and FGV projectile points, on loan from the University of Oregon Museum of Natural and Cultural History. These artifacts are listed in Table 12-1 and have been assigned numbers from 1 to 41 for the purposes of the analysis and discussion below (Figure 12-5). The artifacts were selected based on their chronological type associations and technological criteria, including attributes diagnostic of stone tool manufacture, use and rejuvenation (Flenniken 1981; Flenniken and Raymond 1986; Titmus and Woods 1986; Stueber 2010). Technological analysis indicated that the damage, breakage patterns and flake scar patterns were consistent with projectile points that exhibit damage due to use impact fractures and/or characteristics of rejuvenation to extend use-life. Blood residue extraction and analysis was conducted by Archaeological Investigations Northwest, Inc. (AINW). XRF geochemical sourcing was conducted on 40 of the same projectile points by Northwest Research Obsidian

Table 12-1. Obsidian source and blood residue results for selected projectile points recovered at Glass Buttes by Mack (1975).

| No. | Site or Isolate and Catalog No. | Projectile Point Type | Break Type or Evidence of Repair | Obsidian Source | Distance From Source | Blood Residue |
|---|---|---|---|---|---|---|
| 1 | 35LK326/1 | Clovis | bending | Witham Creek | 120 km | |
| 2 | 35HA81/5 | Crescent | | Buck Spring | 40 km | |
| 3 | 35LK318/4 | Western Stemmed | bending, burin | Chickahominy | 32 km | Bear |
| 4 | 35LK318/3 | Western Stemmed | bending | Bear Creek | 160 km | |
| 5 | Isolate 3 | Western Stemmed | rejuvenation | Glass Buttes 4 | | |
| 6 | 35LK92/1 | Western Stemmed | bending | Wagontire | 24 km | Bear |
| 7 | 35LK322/1 | Cascade | bending | Glass Buttes 3 | | Deer, Rabbit |
| 8 | 35LK278/1 | Cascade | rejuvenation | Big Stick | 32 km | Bovine, Rabbit |
| 9 | 35LK345/1 | Cascade | rejuvenation | Cougar Mtn. | 80 km | Camel |
| 10 | Isolate 10 | Cascade | rejuvenation | Tough Butte | 64 km | |
| 11 | 35LK384/1 | Cascade | bending, facial burin | Tank Creek | 40 km | |
| 12 | 35LK374/1 | Cascade | rejuvenation, bending | MLGV* | 144 km | |
| 13 | 35LK365/1 | Humboldt | bending | Glass Buttes 1 | | |
| 14 | 35LK322/3 | Humboldt | bending | Glass Buttes 3 | | |
| 15 | 35LK293/3 | Northern Side- Notched | rejuvenation | Venator FGV* | 136 km | |
| 16 | 35LK311/1 | Northern Side- Notched | bending | Riley | 32 km | Bovine, Deer |
| 17 | 35HA77/1A | Elko series | rejuvenation, bending | Buck Spring | 40 km | Chicken |
| 18 | 35LK307/1 | Rose Spring | rejuvenation, bending | Carlon (Bald Butte) | 32 km | |
| 19 | 35LK384/2 | Elko | bending | Glass Buttes 9 | | |
| 20 | Isolate 4 | Gatecliff Split Stem | bending | Riley | 32 km | |
| 21 | 35LK385/3 | Elko | rejuvenation | Tank Creek | 40 km | |
| 22 | 35HA77/1B | Rose Spring | bending | Round Top Butte | 40 km | |
| 23 | Isolate 9 | Elko | bending | Burns | 64 km | |
| 24 | 35LK315/1 | Elko | bending | Glass Buttes 3 | | |
| 25 | 35HA82/1 | Fragment | bending | Glass Buttes 4 | | |
| 26 | 35LK306/1 | Elko | bending | Glass Buttes 3 | | |
| 27 | 35LK306/2 | Elko | bending | Glass Buttes 3 | | |
| 28 | 35LK299/2 | Elko | bending | Chickahominy | 32 km | |
| 29 | 35LK366/1 | Gatecliff Split Stem | bending, facial burin | Buck Spring | 40 km | Rabbit |
| 30 | 35LK305/3 | Fragment | bending | Glass Buttes 7 | | Chicken |
| 31 | 35LK359/1 | Western Stemmed | bending | Glass Buttes 1 | | |
| 32 | 35LK314/1 | Distal Fragment | bending, facial burin | Rimrock Spring | 40 km | |
| 33 | 35LK383/1 | Distal Fragment | rejuvenation, bending | Cougar Mtn. | 80 km | Camel |
| 34 | 35LK3172 | Medial fragment | bending | Spodue Mtn. | 90 km | |
| 35 | Isolate 14 | Fragment | bending | Riley | 32 km | |
| 36 | 35LK284/2 | Fragment | bending | Glass Buttes 1 | | |
| 37 | 35LK313/1 | Fragment | bending | Variety 5 | 32 km | |
| 38 | Isolate 12 | Fragment | bending | Tank Creek | 40 km | |
| 39 | 35HA80/1 | Rose Spring | bending | Buck Spring | 40 km | |
| 40 | 35LK301/1 | Rose Spring | bending | Carlon (Bald Butte) | 32 km | |
| 41 | 35HA95/4 | Rose Spring | bending | Whitewater Ridge | 115 km | |

* MLGV=Massacre Lake/Guano Valley; FGV=Fine Grained Volcanic

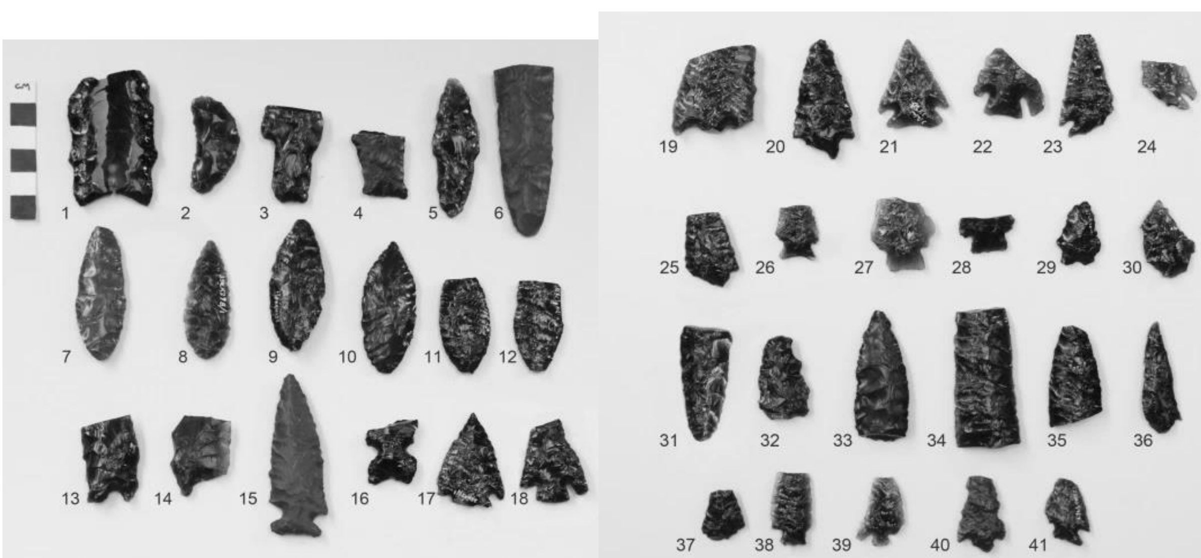


**Figure 12-5. Projectile points recovered at Glass Buttes by Mack (1975) and selected for obsidian source and blood residue analysis.**

Studies Laboratory. No obsidian hydration studies were performed for this project. Geochemical sourcing and obsidian hydration for the Clovis point recovered during the 1975 Mack survey (Artifact 1) was conducted in 2002 by Northwest Research Obsidian Studies Laboratory (Rondeau 2007a).

Results for the geochemical characterization and blood residue analyses provide great insight into the use of Glass Buttes by prehistoric hunter-gatherers. Obsidian tools found at Glass Buttes represent 19 distant sources: Witham Creek, Buck Spring, Chickahominy, Bear Creek, Wagontire, Big Stick, Cougar Mountain, Tough Butte, Tank Creek, Massacre Lake/Guano Valley, Venator Fine-Grained Volcanic, Riley, Carlon (Bald Butte), Variety 5, Tank Creek, Round Top Butte, Burns, Rimrock Spring, Spodue Mountain, and Glass Buttes geochemical varieties 1,3,4,7, and 9 (Table 12-1 and Figures 12-5 and 12-6).

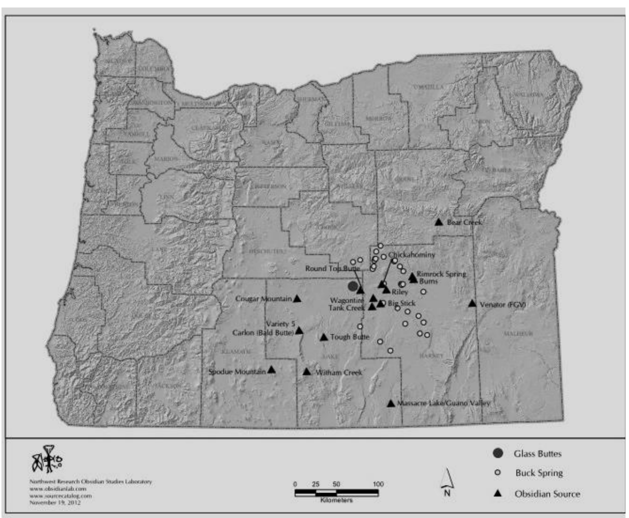


**Figure 12-6. Obsidian and FGV source locations for the Mack 1975 artifacts.**

Blood residue extraction and analysis was conducted on 41 artifacts (Figure 12-5) recovered during the 1975 Mack survey. The artifacts were tested using antisera from 18 species including human. Ten of the artifacts tested positive for blood residues, with three of the 10 artifacts each testing positive for blood residues from two types of animals. The species identified in the positive results include: bear, bovine (bison), camel, chicken (grouse, turkey, quail) deer (white tail deer, mule deer, elk) and rabbit. These results and the corresponding artifacts are shown in Table 12-1 and Figure 12-5. A foliate Cascade point with rejuvenation evidence at the distal portion (Artifact 9), and the distal fragment of a dart point (Artifact 33), both tested positive for camel blood residue. These positive results suggest that these two projectile points were used to hunt North American camels, which became extinct at the end of the Pleistocene. Archaeological sites at Fossil Lake (Minor and Spencer 1977) and Paisley Caves (Jenkins et al. 2012), Oregon, and in southwestern Canada (Kooyman et al. 2012), among other places in western North America, have produced evidence for the existence of this extinct species in association with human activity.

The artifacts collected during the 1975 Mack survey included five Western Stemmed points. Current research at sites containing Western Stemmed points indicates that they are contemporaneous with Clovis points and preceded the period of Clovis technology (Fagan 1988, 1996; Jenkins et al. 2012; O'Grady et al. 2012). The analyses of 41 artifacts from the 1975 Mack survey collection represent a time span from the terminal Pleistocene to the late Holocene, and provide a clear picture that Glass Buttes was a destination for the inhabitants of the region for millennia. These analyses show that a large portion of the artifacts can be traced to 19 distant obsidian sources (Figure 12-6). Two additional distant obsidian sources, Silver Lake/Sycan Marsh and Brooks Canyon, were identified by Jenkins and Connolly (2006) for artifacts they found at Glass Buttes.

Twenty five percent of the Mack survey artifacts had positive results from the blood residue analysis giving an indication of the variety of fauna that was being hunted in the area during this long period of use. In spite of all the available obsidian in the larger region, 13 sources within a 50 km radius (Figure 12-1), the range of chronological types (Figure 12-5 and Table 12-1) and number of artifacts from distant obsidian sources as well as the blood residue evidence, indicate that Glass Buttes was a preferred obsidian source with locally available game hunting opportunities.

## Paleoindians Use of Glass Buttes

### *Paisley Caves*

The Paisley Caves, located in the Summer Lake Basin of south-central Oregon, have been established through rigorous scientific investigation as having the oldest human DNA in North America. These dates, obtained from human coprolites, range in age from approximately 1,242 cal B.P. to 14,600 cal B.P., with the oldest dates being 1,600 years older than Clovis. The Paisley Caves have also produced Western Stemmed projectile points dated as old, or older than, Clovis. The well stratified deposits in Paisley Caves have yielded a wealth of other archaeological materials including sinew and plant fiber threads, leather, basketry, cordage, rope, and wooden pegs, as well as butchered animal bones (including camel) (Jenkins 2008; Gilbert et al 2009; Jenkins et al. 2012). The Paisley Caves are approximately 95 km southwest of Glass Buttes and have yielded seven flakes of Glass Buttes obsidian, most of them from deeply stratified deposits. One flake of Glass Buttes 3 was found in Level 33, approximately two to three meters from a large mammal bone, possibly horse or camel, that dates to 14,404 cal. yrs B.P. Another flake of Glass Buttes 2, from Level 39, is three meters away from a specimen with a date of 13,772 cal. B.P. (Dennis Jenkins personal communication). These data indicate that Pre-Clovis peoples made their way from Glass Buttes to the Paisley Caves.

*Clovis*

At the time of Churchill's 1990 survey (Churchill 1991) the only fluted Clovis projectile point (Bradley et al. 2010) that had been found at Glass Buttes was during the Mack (1975) survey. Since that time, two additional Clovis artifacts have been found at Glass Buttes. In addition, obsidian Clovis artifacts from other sites have been sourced to Glass Buttes.

In 2002, XRF geochemical sourcing conducted on the 1975 Mack survey Clovis point identified Witham Creek as the obsidian source (Rondeau 2007a). The Witham Creek source is located approximately 120 km south, as the crow flies, from Glass Buttes, but a much farther trek for a Clovis-armed traveler (Figure 12-7).

Recently, two more obsidian Clovis artifacts have been found at Glass Buttes. The Sand Flat Clovis, a point fragment, was found to the east of Little Glass Butte, and was sourced to Sugar Hill in northern California, about 160 km to the south (Figure 12-8) (Rondeau 2007b). The second artifact, a fluted Clovis preform, was found south of Glass Butte at Round Top Butte, and was correlated with Big Stick, about 32 km to the east (Scott Thomas personal communication; Rondeau 2007b).


**Figure 12-7. Clovis point recovered during the 1975 Mack survey.**

**Figure 12-8. Sand Flat Clovis.**

There are 39 Clovis artifacts made from Glass Buttes obsidian, now identified, from various sites. The Cottage Grove Clovis, found in the Willamette Valley near Cottage Grove, Oregon, was in the collection of the man that reported its find and who died in the 1920s (Minor 1985:35). This complete Clovis artifact has flute flakes covering its entire length on both faces and is made from Glass Buttes 3 obsidian (Ozbun et al. 1997; Connolly et al. 1994; Ozbun and Stueber 2001). This Clovis point was found approximately 240 km west of Glass Buttes (Figure 12-9).

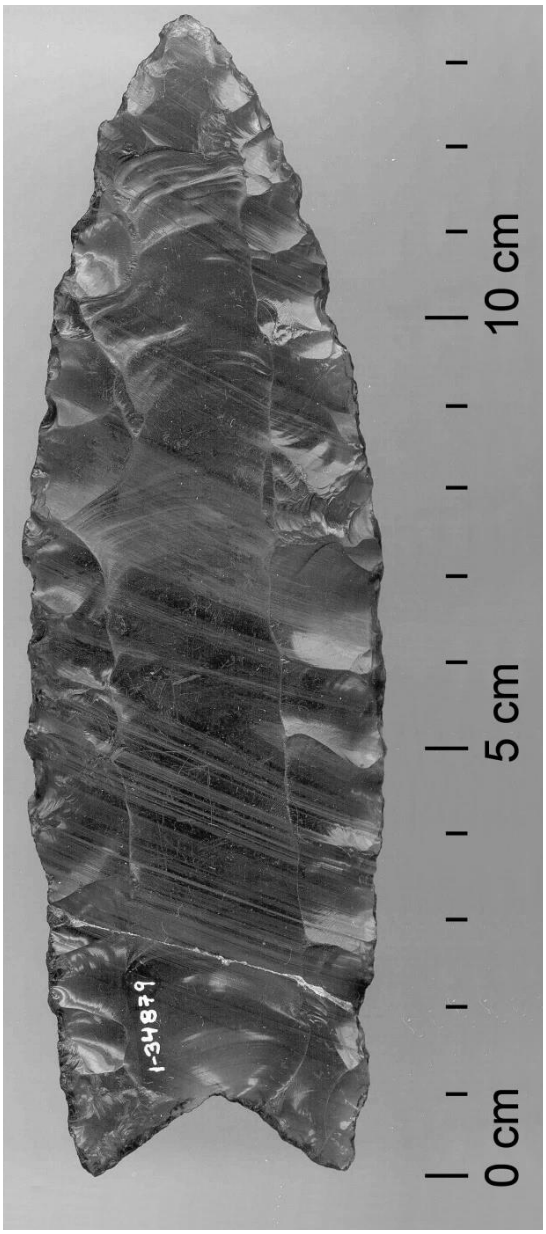


**Figure 12-9. Cottage Grove Clovis.**

The Ilse site Clovis, a base fragment which sources to Glass Buttes 1, was found at Rimrock Lake, northeast Harney County, about 24 km to the east of Glass Buttes (O'Grady and Thomas 2011). The Sheep Mountain site Clovis, a base fragment, sourced to Glass Buttes 1, was found 24 km east of Glass Buttes (O'Grady et al. 2009). An obsidian Clovis point and two associated Clovis artifacts sourced to Glass Buttes 4 were found at the Cal Schmidt site in Harney County (Spencer and Schmidt 1989).

The Dietz Clovis site, located in the northwestern portion of Alkali Basin, Lake County, Oregon, is the largest Clovis site in the Pacific Northwest, and has been studied and reported by a number of researchers (Fagan 1988, 1990, 1996: Pinson 2011; O'Grady, et al. 2012). Earlier obsidian sourcing assigned three of the Clovis artifacts, a point and two flute flakes, to Glass Buttes, and also indicated that 30 artifacts, 17 Clovis points and 13 fluted preforms and flute flakes, were from the Buck Mountain obsidian source in northern California (Fagan 1996). Recent re-evaluation of the putative Buck Mountain Clovis artifacts by O'Grady and the Northwest Research Obsidian Studies Laboratory (2012) has resulted in a reassignment of the source as Glass Buttes geochemical varieties 3 and 6. Thus, based on the recent XRF analysis, 33 of the Dietz Clovis artifacts are now sourced to Glass Buttes (O'Grady, et al. 2012). This abundance of evidence clearly establishes Glass Buttes as an important toolstone source for Clovis toolmakers.

### Non-Paleoindian Glass Buttes Artifacts from Distant Archaeological Sites

Archaeological research in recent decades has provided evidence for the wide geographic distribution of obsidian from Glass Buttes. Glass Buttes obsidian has been found in sites from the northern California coast, throughout Oregon, southern Washington and as far north as southwest British Columbia, eastern Vancouver Island, and the Gulf Islands of British Columbia (Table 12-2 and Figure 12-10). Moore (2009) names Glass Buttes as one of the Great Basin toolstone sources and, because of its high quality material, uses it as a standard by which other obsidian sources are judged (Moore 2009). It is likely that other sites that have not had XRF characterization studies may contain Glass Buttes obsidian artifacts (Ambrose et al. 2001). See Table 12-2 for a list of sites where Glass Buttes obsidian artifacts have been found.

Table 12-2. Sites and areas where Glass Buttes obsidian has been found with references and distance from the source.

| LOCATION | REFERENCE | DISTANCE |
|---|---|---|
| Fort Rock Basin, OR | Skinner et al. 2004 | 136 km |
| Buffalo Flat, OR | Oetting 2004 | 136 km |
| Bone Cave, OR | Ferguson and Skinner 2005 | 130 km |
| Malheur Headwaters, OR | Cadena 2012 | 130 km |
| Ashland, & Southern Willamette Valley, OR | Ozbun and Stueber 2001 | 240 km |
| Celilo, OR | Ozbun et al. 1998 | 230 km |
| Wildcat Canyon, Lower Columbia River, OR | Carlson 1994 | 230 km |
| Meier Site, Portland Basin, OR | Sobel 2011 | 335 km |
| Broken Top Site, Portland Basin, OR | Ellis and Fagan 1993 | 300 km |
| Cathlapotle/Clahclehlah, Lower Columbia River, WA | Sobel 2001, 2011 | 335/280 km |
| Mt. Adams, WA | Hughes 1990 | 400 km |
| Judd Peak, WA | McClure 1989 | 400 km |
| Umpqua/Eden Site, OR | Skinner et al 1999 | 300 km |
| Gold Hill Site, OR | Hughes 1990 | 250 km |
| Gunther Island, CA | Hughes 1978 | 425 km |
| Vancouver Island and Lower Fraser River, BC | Carlson 1994; Arcas 1994 | 770 km |
| Departure Bay Site, BC | Carlson 1994; Arcas 1994 | 885 km |
| Park Farm Site, Pitt Meadows, BC | Carlson 1994; Wilson 2009 | 850 km |

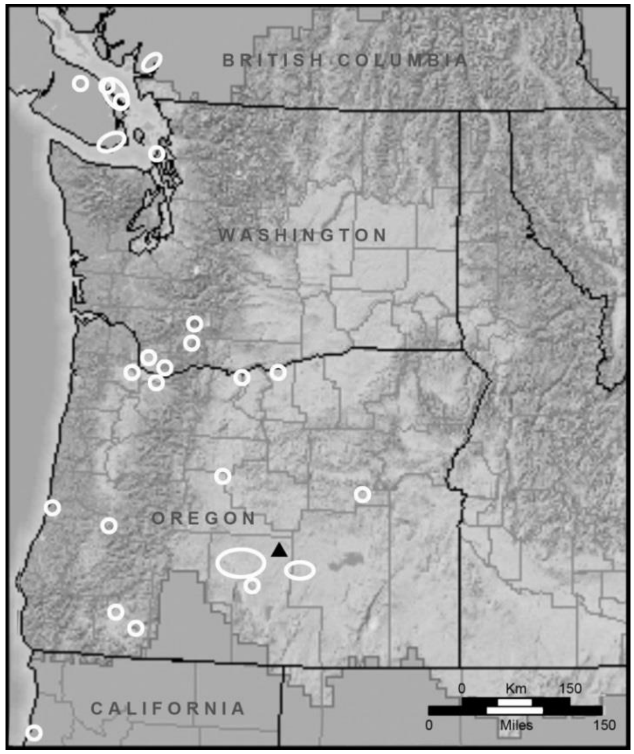


**Figure 12-10. Distribution of Glass Buttes obsidian artifacts discussed in this chapter. Glass Buttes is marked with a triangle.**

## Historic and Modern Use

Theodore (Ted) Orcutt, or Mus-su-peta-na (Up River Boy), was a Karuk Indian born February 25, 1862 in northern California, near the Karuk Indian settlement of Weitchpec on the Klamath River. In 1876, at age 14, Ted began studying flintknapping with his Karuk uncle, Mus-sey-peu-ua-fich (Up River Coyote), who was a master flintknapper. As Ted's skill grew he became well known as a maker of the famous wealth blades used in the White Deerskin Dance. Ted had already been flintknapping for 32 years when, in 1911, Ishi "the last Yahi" met Alfred Kroeber (Harwood 2001; Kroeber 1961).

**Figure 12-11. Karuk flintknapper Ted Orcutt circa 1940.**

From the 1920s through the 1940s Ted made many trips to Glass Buttes to gather large pieces of obsidian and rough out bifacial cores for wealth blades and to fill his many flintknapping orders. Forbes (1936) writes that sometime within the first three decades of the 20th century he accompanied Orcutt on quarrying forays at Glass Buttes, carrying obsidian out on packhorses. He describes watching Orcutt make large bifaces, some 76 cm (30 in) or more in length (Forbes 1936; Mack 1975; Skinner 1983; Harwood 2001) (Figure 12-12).

Glass Buttes continues to be an important locale for obtaining high quality obsidian for the production of stone tools, as it has been for more than 14,000 years. Don Crabtree, widely acknowledged as the father of American lithic technology studies, and author of numerous articles, made collecting trips to Glass Buttes along with renowned lithic technologists Gene Titmus and J. Jeffrey Flenniken (Woods 2010). Many of the scenes in the Crabtree film series, *The Tools of Early Man*, were filmed at Glass Buttes. The first author personally accompanied the great lithic technologist and writer, Errett Callahan, on obsidian collecting trips to Glass Buttes. Since 1985, the annual Glass Buttes Spring Break Knap-in has taken place in March, with as many as 100 flintknappers attending yearly, and collecting obsidian at specific locations.

**Protection**

Although modern flintknappers tend to focus their knapping and quarrying activities to specific locales, as requested by the BLM, the impact is apparent. There is no specific protection plan written for Glass Buttes other than the rock hounding use policy in place on all BLM lands in the Code of Federal Regulations (CFR) under 43 CFR 8365, "Rules of Conduct" on public lands. It states that you are allowed to collect "reasonable amounts" for "non-commercial" purposes, not to exceed 113 kg (250 pounds) of raw material (not partially or completely prepared specimens) per person, per year. Sadly, some people unreasonably exploit this resource and take many hundreds of pounds at a time.

Researchers have made consistent types of recommendations regarding the archaeology of Glass Buttes over the years. Mack recommended a systemic inventory of a number of sites and test excavations at 41 sites at Glass Buttes for the high potential for providing chronological as well as resource use and site activity patterns (Mack 1975: 49-50). Churchill (1991: 78-110) recommended 14 sites as valuable cultural resources eligible for nomination to the National Register of Historic Places (Churchill 1991).

Lebow et al., in their 1990 Cultural Resource Overview for the BLM Prineville District, recommended that the Glass Buttes area be intensively surveyed and the sites be evaluated for inclusion in the National Register of Historic Places as a district (Lebow et al.: 187-188).

In spite of damage to ancient archaeological deposits from modern use, there is still tremendous archaeological potential at Glass Buttes as seen by the work of O'Grady's and Thomas's Clovis Quest Project in locating potential Clovis workshops (Scott Thomas, personal communication 2010, 2012). Other areas for future research include more extensive survey and sub-surface testing of sites in light of the 2006 work of Jenkins and Connolly, and the possibility of identifying additional lithic technological traditions and pre-Clovis activity. Advances in XRF technology make the re-evaluation of the geochemistry of artifacts at a number of sites important for the potential to gain new information, as was done at the Dietz Site (O'Grady et al. 2012). There is still much to learn about Glass Buttes.

*Acknowledgements*. Thanks to Terry Ozbun and Ron Adams of AINW for organizing this publication and the SAA symposium from which it was born. Thanks and gratitude to Jo Reese and John Fagan of AINW for continued support. Thanks to Pam Endzwig and the staff at the University of Oregon Museum of Natural and Cultural History for facilitating the loan of artifacts. Thanks to Joanne Mack, University of Notre Dame, for the report that inspired this work. Thanks to Tom Churchill, Archaeological Frontiers, for providing a copy of his report. Special thanks to University of Oregon Museum of Natural and Cultural History's Dennis Jenkins, for his generous sharing of information and Paisley Caves data, and also Patrick O'Grady for sharing Dietz site data. Thanks to Scott Thomas and John Zancanella of Oregon BLM for assistance in the project. Thanks to John Fagan, Terry Ozbun, Ron Adams, Dennis Jenkins, and Nancy Stueber for comments, editorial help and assistance. Thanks to Joe Bartholomew for help with images and maps, and to Jennifer Thatcher for map assistance. Thanks to Rick Minor, Heritage Research Associates, Eugene, Oregon; Duncan McLaren, Cordilleran Research Associates, BC, Canada; Eric Forgeng, Ministry of Forests, BC, Canada; and Mike Rondeau, Rondeau Archaeological, Sacramento, California for providing help and information. Special thanks to friend and fellow flintknapper Dennis Torresdal who took me to Glass Buttes for the first time in 1982. This manuscript is dedicated to the memory of Peter Ainsworth, friend and mentor, with whom I spent countless hours at Glass Buttes learning about and experiencing that magnificent, ancient place.

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