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Authors
Hutchins, James
Simons, Dwight D

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JAMES HUTCHINS and DWIGHT D. SIMONS

Kautz Environmental Consultants, Inc., 5200 Neil Rd., Suite 200, Reno, NV 89502.

The Truckee Meadows is a well-watered valley in western Nevada with archaeological evidence of aboriginal human occupation extending from 150 B.P. to about 10,000 B.P. Obsidian samples from 27 archaeological sites in and around the Truckee Meadows (401 individual specimens) have been analyzed for geochemical source determination, and 183 of these obsidian specimens have been analyzed for hydration rind thicknesses. A total of 20 different obsidian sources in seven distinct geographic localities is represented in the combined obsidian samples. Despite this great diversity, 46% of the sample obsidian was derived from local sources, while 38% was derived from the Mono Basin in southeast California. The remainder of the sample obsidian (16%) was derived from sources scattered throughout northeast California and northwest Nevada, as well as from several unidentified sources. No temporal trends or shifts in the utilization of particular obsidian sources are apparent in the sample. Hydration rind thicknesses vary from 0.8 μ to 9.8 μ, but the data for Sutro Springs obsidian suggest that hydration rind thickness is an unreliable technique for determining the age of obsidian artifacts, whether relative or absolute.

DURING the last two decades, obsidian studies have become increasingly important in the archaeology of far western North America, especially in northern and central California (see Taylor 1976; Earle and Ericson 1977; Ericson and Earle 1982; Hughes 1982, 1984, 1985, 1986, 1989, 1994; Hughes and Bettinger 1984; Hughes and Bennyhoff 1986; Jackson 1986, 1988; White et al. 1993; Baugh and Ericson 1994). Many obsidian studies have provided the foundations for archaeological inferences regarding dynamics of prehistoric land use, patterns of trade and exchange, ethnicity, and population movements. For example, in a landmark study of obsidian procurement patterns in northeastern California and south-central Oregon, Hughes (1986) established that the identified obsidian sources represented are more numerous and more distant in sites characterized by temporally diagnostic Elko series projectile points than in sites dated to earlier or later periods.

The relative abundance of obsidian from diverse and distant sources provided the basis for suggesting that the obsidian was procured indirectly by exchange through an extensive obsidian trade network which flourished during Elko times, but was less expansive at other times (Hughes 1986). Using similar data, diachronic variability in relative abundance of obsidian from diverse and distant sources at sites in Drews Valley in south-central Oregon has been explained by shifting settlement patterns and population movements of people who are assumed to have procured their obsidian directly at the sources, rather than indirectly through exchange (Connolly and Jenkins 1997).

A number of obsidian studies has been conducted in the Truckee Meadows, producing specific obsidian source information for 363 specimens, as well as 183 hydration rind measurements. This report synthesizes the results of these studies in order to characterize the obsidian data recovered from sites within and around the Truckee Meadows. In the following sections, we provide a brief overview of the Truckee Meadows, present a summary of the currently available obsidian data, and discuss apparent trends in the data.

THE TRUCKEE MEADOWS

The Truckee Meadows (Figs. 1 and 2) is named for the Truckee River, which flows through the valley from west to east, taking water from Lake Tahoe to Pyramid Lake (Glancy et al. 1984; Gates and Watters 1992). It is one of several well-watered, lushly vegetated valleys located along the east front of the northern Sierra Nevada. The Truckee Meadows is approximately 19 km. (12 mi.) north/south by 16 km. (10 mi.) east/west, and

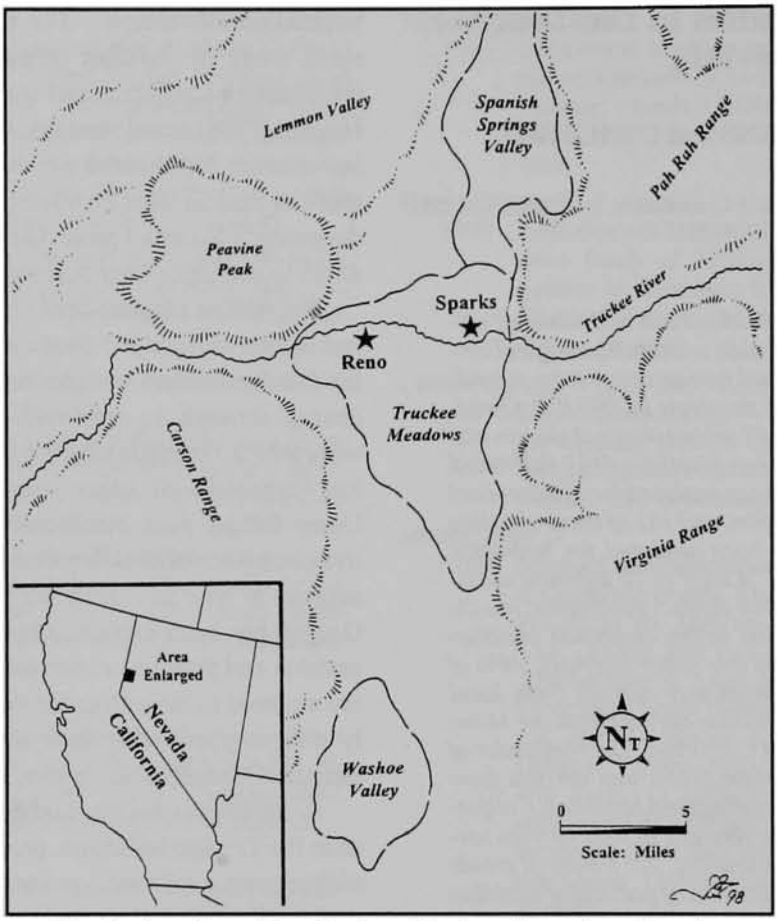

Fig. 1. Location of the Truckee Meadows in western Nevada.

is bounded on the west by the Carson Range, whose highest point is Mount Rose (3,285 m. [10,776 ft.]). To the north is Peavine Mountain (2,519 m. [8,266 ft.]), surrounded by lower hills.

The eastern boundary of the Truckee Meadows basin is formed by the Virginia Range, which has a number of peaks above 6,000 ft. (1,830 m.), such as Louse Peak (2,092 m. [6,862 ft.]). The Steamboat Hills at the southern end of the Truckee Meadows have a maximum elevation of 1,883 m. (6,178 ft.). The floor of the Truckee Meadows has an average elevation of 1,372 m. (4,500 ft.). Spanish Springs Valley and Lemmon Valley lie immediately north of the Truckee Meadows, while Pleasant Valley and Washoe Valley are situated to the south. The route of the historic Central Pacific Railroad (completed in 1868) followed the Truckee River through the Truckee Meadows, promoting the initial growth of the cities of Reno and Sparks along the river.

Prehistoric human occupancy of the Truckee Meadows and environs appears to have begun about 10,000 B.P. with the pre-Archaic Period Washoe Lake Phase, represented by isolated finds of fluted points (Elston 1986; Elston et al. 1994, 1995). Great Basin Stemmed series points typify the subsequent Tahoe Reach Phase, which lasted from ca. 10,000 to 8,000 B.P. The Spooner Phase (8,000 to 5,000 B.P.) marks the Early Archaic Period, during which adaptive strategies involving less mobility and more intensive reliance upon plant foods and small game began to emerge.

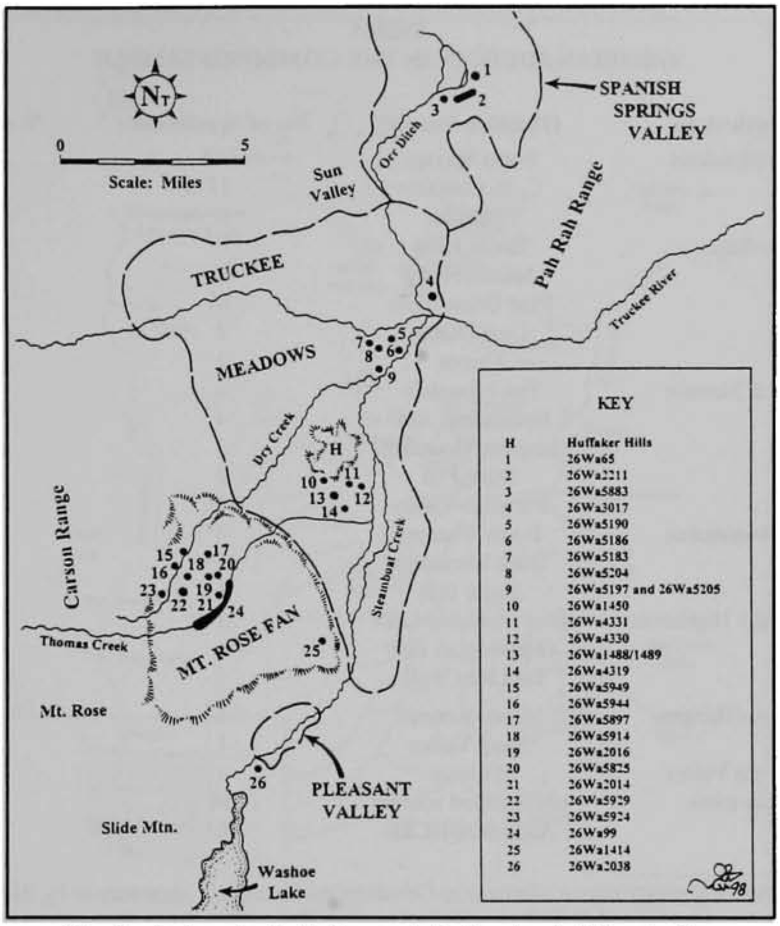

Fig. 2. Archaeological sites contributing to obsidian studies.

A dramatic increase in archaeological visibility characterizes the Middle Archaic Period Martis Phase (5,000 to 1,300 B.P.). It is distinguished by a well-developed biface reduction trajectory, characterized by Martis series and Elko series dart points, and a variety of bifaces, retouched flakes, and perforators/gravers, often made from basalt (Elston 1986; Elsasser and Gortner 1991). A plethora of Martis Phase sites occurs, often containing associated features such as houses, cache pits, and hearths. The frequent presence of substantial quantities of ground stone artifacts at Martis Phase sites, especially manos and metates/milling stones, attests to the importance of plant foods.

The subsequent Late Archaic Period is marked by a number of cultural changes: introduction of the bow and arrow; an apparent preference for chert (i.e., cryptocrystalline silicates) toolstone; reduction in tool size; possible reduction in house size; introduction of bedrock mortars and hullers as a consequence of the development of the acorn/pinyon complexes; and establishment of more permanent, established winter base camps (Elston 1986; Elston et al. 1995). The Late Archaic Period is divided into two temporal phases. Rosegate series and Gunther series projectile points are typical of the Early Kings Beach Phase (1,300 to 700 B.P.). These are replaced during the Late Kings Beach Phase (700 to 150 B.P.) by Desert series points. The Late Kings Beach Phase coincides with the Terminal Archaic Period defined for the western Great Basin in general. It has been argued that the

Table 1
OBSIDIAN SOURCES IN THE COMBINED SAMPLE

Geographic Area	Obsidian Source[a]	No. of Specimens	% of Total
Truckee Meadows	Sutro Springs	148	36.9
	C. B. Concrete	37	9.2
	Patrick	0	0.0
Mono Basin	Bodie Hills	79	19.7
	Mount Hicks	53	13.2
	Pine Grove Hills	16	4.0
	Casa Diablo	2	0.5
	Queen	1	0.25
Northwest Nevada	Fox Mountain	6	1.5
	Homecamp A, B	4	1.0
	Majuba Mountain	3	0.75
	Duck Flat	2	0.5
	Paradise Valley	1	0.25
Warner Mountains	South Warners	4	1.0
	Buck Mountain	1	0.25
	Sugar Hill	1	0.25
Medicine Lake Highlands	East Medicine Lake	1	0.25
	Grasshopper Flat/ Lost Iron Wells	1	0.25
North Coast Ranges	Mount Konocti	1	0.25
	Napa Valley	1	0.25
Sacramento Valley	Tuscan	1	0.25
multiple areas	unidentified sources	38	9.5
	ALL SOURCES	401	100

[a] Source determinations were performed by Geochemical Research Laboratory or by Biosystems Analysis, Inc. Hydration rind thicknesses were measured by the Obsidian Hydration Laboratory at the Anthropological Studies Center, Sonoma State University, or by Biosystems Analysis, Inc.

Late Archaic peoples inhabiting the Truckee Meadows and environs were the ancestors of the ethnohistoric and present-day Washoe, for whom the Truckee Meadows was (and is) part of their core territory (e.g., Price 1962, 1980; Downs 1966; d'Azevedo 1986; Elston et al. 1994, 1995).

OBSIDIAN STUDIES

Obsidian samples from 27 sites within and around the Truckee Meadows have been analyzed to determine geochemical sources (Figs. 2 and 3). The results of these obsidian analyses were presented by Clay (1990), Matranga (1992), Moore and Burke (1992), Hughes (1995), Origer (1995), Kautz (1996), Kautz and Christensen (1996), Simons and Hutchins (1996), Simons and Kautz (1996), Delacorte (1997), Hutchins et al. (1997a, 1997b), Simons (1997a, 1997b), and Mires and Hutchins (1998). Many of the obsidian specimens were also analyzed to measure hydration rind thicknesses. The combined results of obsidian source determinations are summarized in Table 1.

A total of 20 different obsidian sources from seven distinct geographic localities was identified from the samples. Obsidian was derived from sources as far north as Sugar Hill (160 mi. distant) in the Warner Mountains, as far south as Casa Diablo near the Mono Basin (130 mi. distant), as far east as Paradise Valley in northwest Nevada (180 mi. distant), and as far west as Mount Konocti in the North Coast Ranges of California (160 mi. distant) (Fig. 3). Despite this great diversity, 46%

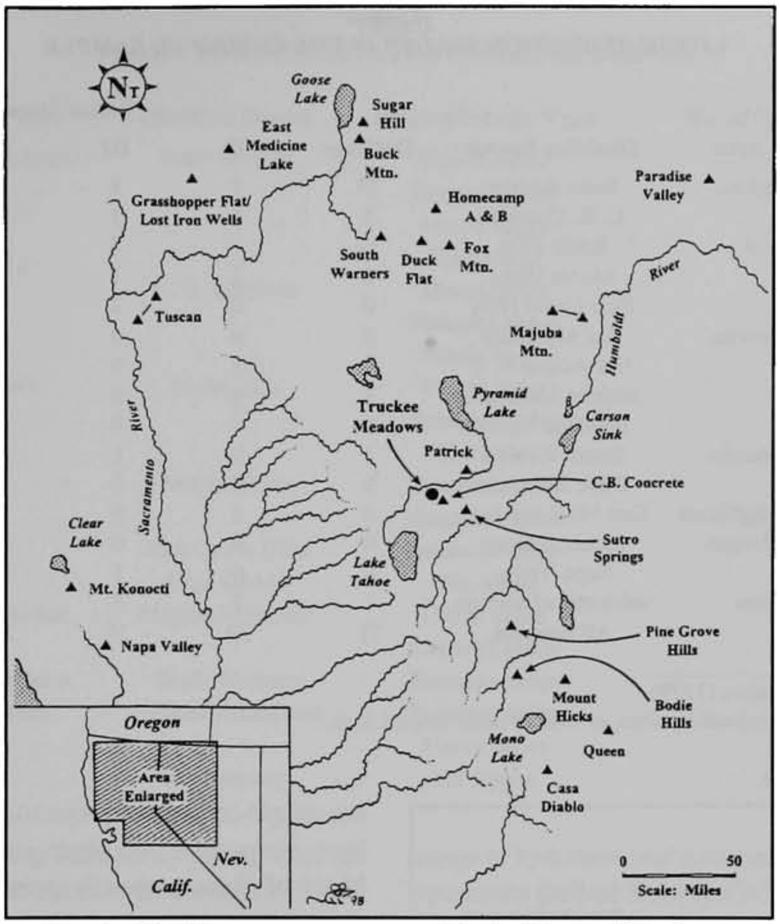

Fig. 3. Obsidian sources represented in the Truckee Meadows.

of all sample obsidian was obtained from local sources, while 38% was obtained from the Mono Basin (including Bodie Hills, Mount Hicks, Pine Grove Hills, Casa Diablo, and Queen). Figure 4 shows the proportional distribution of sample obsidian by geographic area (for readability, the data for the Warner Mountains, Medicine Lake Highlands, North Coast Ranges, and Sacramento Valley are grouped into "Northern California"). One local obsidian source (Patrick) is conspicuously absent from the samples, even though Patrick obsidian has been recovered from nearby sites in the Pah Rah Range (Delacorte 1997:115-120).

The distribution of obsidian debitage and biface reduction stages is shown in Table 2. The bifaces were classified according to the five-stage system of Callahan (1979), in which Stage I is an unmodified flake blank, Stage V is a finished tool, and Stages II through IV are intermediate stages of progressive biface reduction. Biface stages were ambiguous or not stated in a number of the reports reviewed, so only 223 pieces are listed in Table 2. It seems very likely that many more finished artifacts (Stage V) have been submitted for source determination than debitage and intermediate stage bifaces, resulting in a disproportionate representation of projectile points and other formed tools. However, the presence of debitage and early stage bifaces (i.e., Stages II and III) knapped from Mono Basin obsidian indicates that at least some of the obsidian from Mono Basin sources arrived in the Truckee Meadows as cores, blanks, and/or rough-outs,

Table 2
LITHIC REDUCTION STAGES IN THE COMBINED SAMPLE

			Biface Stages[a]			
Geographic Area	**Obsidian Source**	**Debitage**	**II**	**III**	**IV**	**V[b]**
Truckee Meadows	Sutro Springs	43	7	8	4	27
	C. B. Concrete	5	5	3	4	5
Mono Basin	Bodie Hills	12	2	8	8	20
	Mount Hicks	6	2	1	7	6
	Pine Grove Hills	0	0	2	1	1
Northwest Nevada	Fox Mountain	2	0	0	1	0
	Homecamp A, B	0	2	0	1	0
	Majuba Mountain	1	0	0	0	2
	Paradise Valley	0	0	0	0	1
Warner Mountains	South Warners	1	0	1	0	2
	Buck Mountain	0	0	0	0	1
Medicine Lake Highlands	East Medicine Lake	0	0	0	0	2
North Coast Ranges	Mount Konocti	0	0	0	1	0
	Napa Valley	0	0	1	0	0
multiple areas	unidentified sources	1	2	5	1	8
	All Sources	71	20	29	28	75

[a] From Callahan (1979).
[b] Includes projectile points, as well as other formed tools.

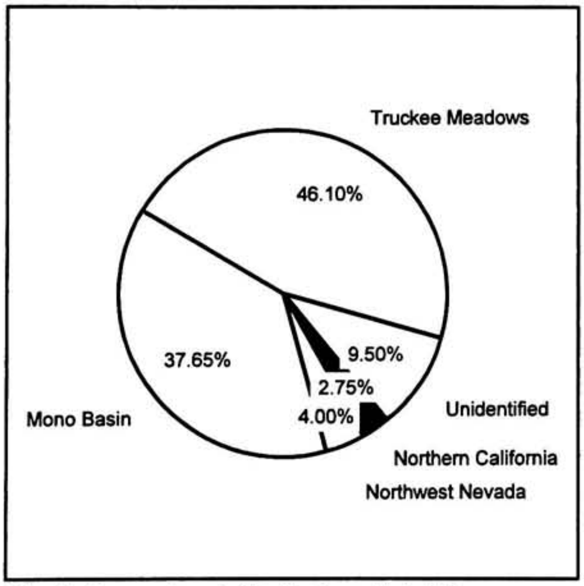

Fig. 4. Proportional distribution of obsidian sources.

rather than as finished artifacts. The same is true, of course, for obsidian derived from local sources.

A total of 46 specimens in the combined obsidian sample consists of projectile points which have been assigned to morphological types (Table 3). Most of these projectile point types have well-defined temporal ranges in the western Great Basin (Thomas 1981; Elsasser and Gortner 1991), and provide chronological information regarding the time periods during which particular obsidian sources were utilized. Desert series (Late Kings Beach Phase) points in the sample were derived from obsidian sources in the Truckee Meadows and the Mono Basin. Rosegate series (Early Kings Beach Phase) points in the sample came from a variety of obsidian sources located in the Truckee Meadows, the Mono Basin, the Warner Mountains, and two unidentified source localities. Elko series (Martis Phase) points originated from sources in the Truckee Meadows and the Mono Basin. Martis series (Martis Phase) points were derived from obsidian sources in the Truckee Meadows, northwest Nevada, and three unidentified source localities.

Curiously, no Mono Basin sources are represented in the sample of Martis series points, even

Table 3
PROJECTILE POINTS IN THE COMBINED SAMPLE

Geographic Area	Obsidian Source	Projectile Point Type	No. of Specimens
Truckee Meadows	Sutro Springs	Desert series	4
		Rosegate series	10
		Martis series	3
		Elko series	1
	C. B. Concrete	Desert series	1
		Rosegate series	1
		Martis series	1
Mono Basin	Bodie Hills	Desert series	2
		Rosegate series	8
		Elko series	3
	Mount Hicks	Rosegate series	1
		Humboldt series	1
	Pine Grove Hills	Humboldt series	1
	Casa Diablo	Elko series	1
Northwest Nevada	Majuba Mountain	Martis series	1
		Gatecliff series	1
Warner Mountains	South Warners	Rosegate series	1
multiple areas	unidentified sources	Rosegate series	2
		Martis series	3
	All Sources	**All Types**	46

though contemporary Elko series points were derived from obsidian sources in the Mono Basin. Three of the projectile points are not usually associated with particular cultural phases in the Truckee Meadows. Two Humboldt series points (3,000 B.C. to A.D. 700) occur in the sample, both from Mono Basin sources. A single Gatecliff series point (Split-stemmed variety; 3,000 to 1,300 B.C.) originated from Majuba Mountain in northwest Nevada. No temporal trends in the utilization of particular obsidian sources are apparent in the sample. On the contrary, it seems clear that the Truckee Meadows and the Mono Basin were the primary geographic sources of obsidian throughout the Middle Archaic and Late Archaic Periods, a time span from approximately 5,000 to 150 B.P.

Hydration rind thicknesses are summarized by obsidian source in Table 4. Figures 5 and 6 present hydration rind measurements for Bodie Hills and Sutro Springs, the most abundantly represented obsidian sources in the combined sample. The wide range of hydration rind measurements for obsidian specimens derived from Bodie Hills (0.8 to 8.4 μ), C. B. Concrete (0.9 to 8.4 μ), Mount Hicks (2.1 to 9.8 μ), and Sutro Springs (0.9 to 8.6 μ) suggests a long time span for utilization of these Truckee Meadows and Mono Basin obsidian sources, and are consistent with the potential time span implied by temporally diagnostic projectile point types from the Middle Archaic and Late Archaic periods. Only 18 typeable projectile points in the combined obsidian sample had hydration rinds measured (Table 5). Although this small number of points is inadequate for correlating specific ranges of hydration rind thicknesses with particular temporally diagnostic projectile point types, these data contribute to the available data base for such research.

DISCUSSION

Exotic obsidian at Truckee Meadows sites and localities was derived primarily from the Mono Ba-

Table 4
HYDRATION RIND MEASUREMENTS IN THE COMBINED SAMPLE[a]

Obsidian Source	Hydration Rind Thickness	Range	Mode(s)
Bodie Hills	0.8, 1.0, 2.1, 2.1, 2.2, 2.2, 2.4, 2.4, 2.5, 2.5, 2.6, 2.7, 2.7, 2.7, 3.0, 3.0, 3.1, 3.1, 3.5, 3.5, 4.2, 4.2, 4.4, 4.4, 4.5, 4.8, 4.8, 4.8, 4.8, 4.9, 5.0, 5.2, 5.2, 5.2, 5.2, 5.3, 5.6, 5.7, 6.2, 6.2, 6.3, 6.4, 6.4, 6.7, 6.7, 6.8, 6.9, 7.8, 7.9, 8.4	7.6	4.8, 5.2
Bordwell Spring	1.0	--	--
Casa Diablo	2.1, 4.3	2.2	--
C. B. Concrete	0.9, 1.7, 1.7, 2.4, 2.8, 2.9, 3.2, 3.4, 3.4, 3.7, 4.5, 4.7, 5.0, 7.8, 8.0, 8.1, 8.4	7.5	1.7, 3.4
Duck Flat	3.0, 6.1	3.1	--
Fox Mountain	1.6, 4.7, 4.7, 5.1, 6.1, 7.3	5.7	4.7
Homecamp A, B	2.7	--	--
Majuba Mountain	7.1	--	--
Mount Hicks	2.1, 2.5, 2.6, 2.6, 2.7, 2.7, 2.7, 2.7, 2.8, 2.9, 2.9, 2.9, 3.0, 3.0, 3.0, 3.1, 3.1, 3.1, 4.1, 4.4, 5.0, 5.2, 5.7, 6.0, 6.0, 6.1, 6.9, 9.8	7.7	2.7
Pine Grove Hills	5.8	--	--
South Warners	2.5, 4.1	1.6	--
Sugar Hill	8.6	--	--
Sutro Springs	0.9, 0.9, 1.0, 1.1, 1.3, 1.7, 1.8, 2.0, 2.2, 2.3, 2.4, 2.4, 2.4, 2.4, 2.5, 2.5, 2.5, 2.5, 2.5, 2.6, 2.6, 2.6, 2.6, 2.6, 2.7, 2.7, 2.7, 2.7, 2.9, 3.0, 3.0, 3.1, 3.1, 3.1, 3.2, 3.2, 3.3, 3.4, 3.4, 3.5, 3.6, 3.8, 3.8, 3.8, 3.8, 4.0, 4.0, 4.0, 4.1, 4.2, 4.3, 4.5, 4.7, 4.7, 4.8, 4.8, 4.9, 5.1, 5.2, 5.2, 5.7, 6.0, 6.1, 6.2, 6.8, 7.2, 7.5, 7.7, 7.8, 7.9, 8.6	7.7	2.5, 2.6

[a] All measurements are in microns.

sin. Approximately 38% of the sample obsidian came from five sources in and around the Mono Basin, including Bodie Hills, Mount Hicks, Pine Grove Hills, Casa Diablo, and Queen. This conspicuous concentration of Mono Basin obsidian in the Truckee Meadows suggests a close cultural relationship between the populations of these two geographic areas, and the range of temporally diagnostic projectile point types knapped from Mono Basin obsidian indicates that the link persisted from the Middle Archaic Period through the Terminal Archaic Period. The Washoe provide ethnographic evidence for this link. They were aware of the excellent obsidian available in the Mono Basin, and obtained it directly from the sources (Price 1962:50). They may have obtained the obsidian while engaged in procuring another important resource in the Mono Basin, i.e., fly larvae known as "kutsavi," which the Washoe obtained fresh from the lake during late summer, or as a dried food commodity received in trade with the Northern Paiute (Price 1962:52; d'Azevedo 1986:476).

In addition to extracting Mono Basin obsidian for their own use, the Washoe may have collected it as a valuable commodity. The Washoe exported obsidian and other commodities to the neighboring

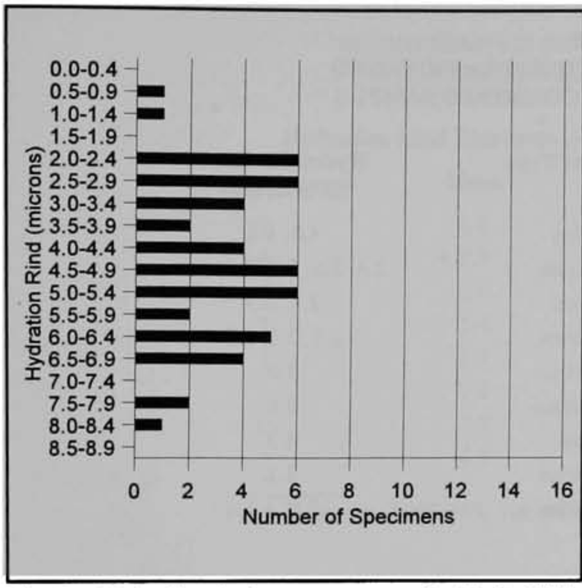

Fig. 5. Hydration rind measurements for Bodie Hills obsidian.

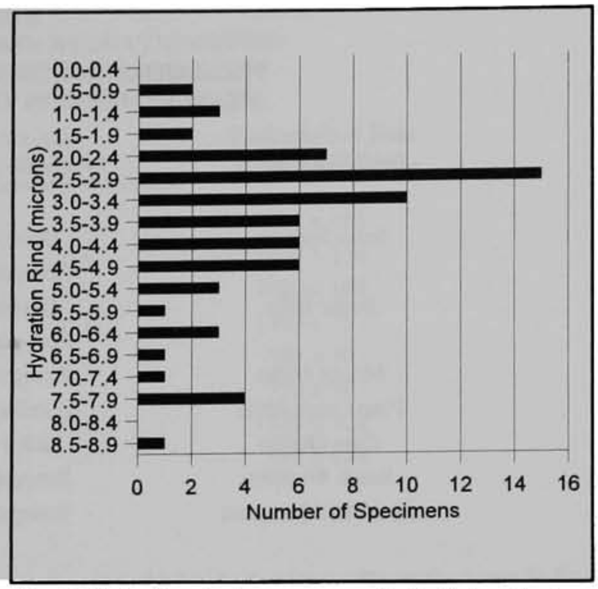

Fig. 6. Hydration rind measurements for Sutro Springs obsidian.

Miwok, Nisenan, and Northern Paiute, receiving a variety of goods in exchange (Price 1962:51; Hughes and Bennyhoff 1986:242). The Mono Basin, then, was economically important to the ethnographic Washoe as a source of obsidian and as a source of bulk food that could be stored for winter use. The prehistoric peoples of the Truckee Meadows seem to have had a similar economic relationship to the Mono Basin.

The proportional distribution (Fig. 4) in the Truckee Meadows of obsidian from Mono Basin and other exotic sources is consistent with the model of prehistoric obsidian exchange networks in the northern Sierra Nevada and environs developed by Markley and Day (1992:187, Fig. 11) and corroborated by Jackson et al. (1994). On both sides of the north-central Sierra Nevada crest, Bodie Hills obsidian appears to have commonly circulated in a northerly direction from its source. In contrast, obsidian derived from sources located in northeastern California and northwestern Nevada generally were dispersed south along the west side of the Sierran axis to the area lying west of the Tahoe Basin. Obsidian from the North Coast Ranges often made its way east across the Sacramento Valley to Sierran sites located west of Lake Tahoe and farther north. South of Lake Tahoe, obsidian originating from the Mono Basin and environs frequently was dispatched west into central California. According to this model, then, the most abundantly represented exotic obsidian source in the Truckee Meadows would be Bodie Hills. The model is supported by the data in this study (see Table 1).

The Truckee Meadows combined obsidian sample suggests that there may be a significant problem with hydration dating of Sutro Springs obsidian, whether relative or absolute. As shown in Table 5, the hydration rinds on Desert series points knapped from Sutro Springs and Bodie Hills obsidian are generally *thicker* than the hydration rinds on older, Rosegate series points. For the Bodie Hills specimens, the discrepancy is slight and might be interpreted as an indication of temporal overlap. For the Sutro Springs specimens, however, the discrepancy is substantial and difficult to explain. One of these Sutro Springs obsidian Desert series points (4.0 μ hydration rind) was recovered from 26Wa4331 in the south Truckee Meadows, and the other (4.8 μ hydration rind) comes from

Table 5
PROJECTILE POINTS WITH HYDRATION RIND MEASUREMENTS IN THE COMBINED SAMPLE

Obsidian Source	Projectile Point Type	Hydration Rind (in microns)
Sutro Springs	Desert series	4.0, 4.8
	Rosegate series	2.4, 2.6, 2.6, 3.0, 4.1
Bodie Hills	Desert series	2.4, 2.5
	Rosegate series	2.1, 2.1, 5.2
Mount Hicks	Rosegate series	3.0
Pine Grove Hills	Humboldt series	5.8
Casa Diablo	Elko series	4.3
South Warners	Rosegate series	4.1
unidentified sources	Rosegate series	2.0, 4.2

26Wa2211 in Spanish Springs Valley (Fig. 2). In both cases, these Sutro Springs obsidian Desert series points have thicker hydration rinds than the Sutro Springs obsidian Rosegate series points recovered from the same sites in similar depositional contexts. Although the sample is small, this anomaly is contrary to the general principle that the thicker the hydration rind thickness, the older the specimen, implying that chronological frameworks based on hydration dating (relative or absolute) of Sutro Springs obsidian may be untenable.

Further evidence of anomalous hydration rind development in Sutro Springs obsidian was provided by Delacorte (1997:143-146). His chronological framework based on obsidian hydration rind dating assigned absolute dates to artifacts knapped from Sutro Springs obsidian, but his own data demonstrated the extreme variability in hydration rind formation. Analysis of the eight pairs of mean hydration rind thicknesses on Sutro Springs obsidian artifacts and mean radiocarbon dates for associated archaeological features (Table 6) indicates a correlation of Pearson's $r = 0.15$, which yields an explained variance of Pearson's $r^2 = 0.02$ (i.e., the variance is essentially unexplained). Using Spearman's r, an equivalent (though less sensitive) nonparametric correlation coefficient, the correlation between hydration rind thicknesses and radiocarbon dates is 0.17. In other words, the Sutro Springs hydration rind thicknesses are essentially independent of the associated radiocarbon dates, and *time* appears to be an insignificant variable contributing to the formation of hydration rinds on Sutro Springs obsidian. Since Delacorte's (1997: 146-150) inferences regarding temporal trends in prehistoric settlement and subsistence patterns in the Truckee Meadows region are based largely on absolute hydration dating of Sutro Springs obsidian, they are dubious and unconvincing.

Obsidian hydration rind development and retention are affected by a variety of factors, including available moisture, ambient temperature, depositional context, density of overlying sediments (if any), and subsurface movement due to trampling, bioturbation, cryoturbation, and other disturbance processes (Schiffer 1987:121-140). The obsidian data from the Truckee Meadows suggest that these factors (and perhaps others) produce variable rates of hydration rind development and retention for Sutro Springs obsidian through time, and that hydration rind thickness is not a reliable technique for determining the age of Sutro Springs obsidian artifacts, neither for relative nor absolute dates. If this is true for Sutro Springs obsidian, it may also be true for obsidian derived from other sources.

Table 6
SUTRO SPRINGS OBSIDIAN HYDRATION RINDS AND ASSOCIATED RADIOCARBON DATES[a]

Hydration Rind Thickness (in microns)			Radiocarbon Date (years B.P.)
No. of Specimens	Mean	Standard Deviation	
1	2.0	--	930 ± 150
6	2.3	0.4	820 ± 150
4	2.4	0.7	1040 ± 100
2	2.4	0.1	1060 ± 70
1	2.7	--	480 ± 70
1	2.9	--	770 ± 70
13	3.1	0.5	1320 ± 320
1	4.5	--	990 ± 100

[a] From Delacorte (1997:145, Table 30).

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