ARROWS CAST THROUGH TIME: ROSEGATE PROJECTILE POINTS AS A TIME MARKER AT THE PORTUGUESE FLAT SITE (FRE-137)

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ABSTRACT

The archaeological investigations at FRE-137 (the Portuguese Flat site) span many decades and dozens of archaeologists. My Master's thesis is an excavation report for this site, this short paper discusses a portion of the information available through the analysis of materials recovered, namely the suitability of using Rosegate Series projectile points as a time-marker at this locality.

INTRODUCTION

After a brief description of FRE-137, an overview of the archaeological investigations, and a summary of the analytical methods employed for this study, I will discuss projectile point classifications. In conclusion I will compare the results of analysis of FRE-137 materials with chronologies from neighboring areas, and discuss the suitability of using Rosegate Series projectile points as a time-marker.

FRE-137 (Forest Service Number 05-15-53-145; Figure 1) is located on the Sierra National Forest near the crest of the Sierra Nevada at an elevation of approximately 2044 meters (6700 feet). The site is situated on a knoll-top surrounded by meadow, with an exposed granite outcrop near the headwaters of the south fork of the San Joaquin River. Camp Creek, a perennial water course, runs along the eastern edge of the site, and a snow pond lies in the northwest portion of the site. The vegetation on and in the vicinity of the site is the upper margin of Montane Forest including lodgepole pine, Jeffrey pine, and an occasional incense cedar as well as a riparian zone of alder and mixed conifer forest which runs along the creek (Ornduff 1974:66; Dellavalle and Kipps 1984).

A Native American archaeological site comprised of midden soils, a bedrock milling station, and an extensive lithic scatter of predominantly obsidian, FRE-137 is one of the richest sites in the area. In addition to the flake stone scatter and ground stone, steatite vessel sherds and Owens Valley Brown Ware pottery as well as steatite and glass trade beads are also present. Large mammal (most likely deer) and rodent bones are the extent of the faunal remains.

BACKGROUND

Recorded with some materials surface collected in 1959 by Hindes (1959, 1960, 1993) and excavated in 1960 with the technical support of Albert Elsasser and the University of California, Berkeley, Archaeological Survey (Hindes 1959, 1960), the artifacts recovered from the site during these initial investigations are accessible through the Phoebe Hearst Museum of Anthropology at

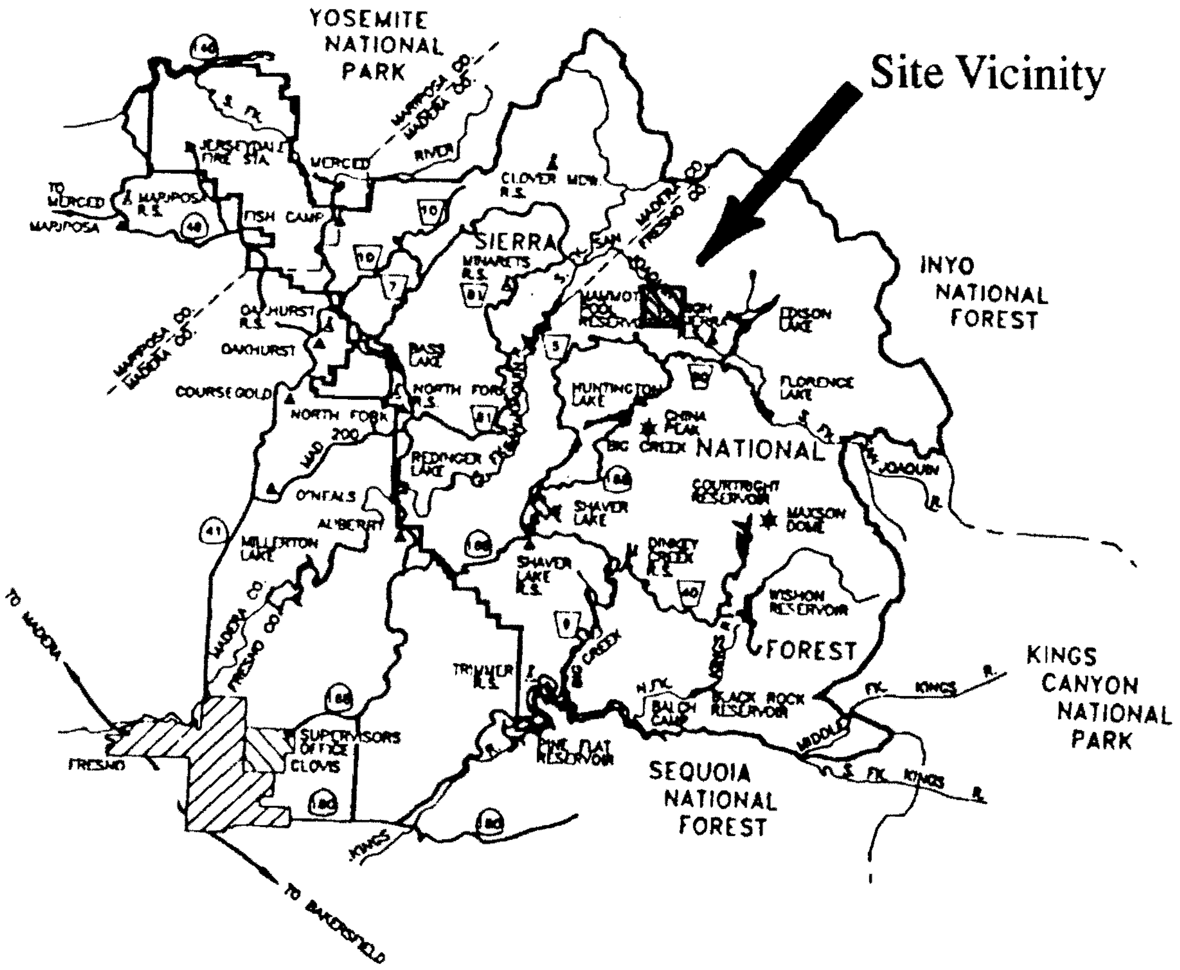

Figure 1. FRE-137 site vicinity map.

the University of California, Berkeley. A small collection of notes and photographs accompany the collection. The results from this excavation are summarized in an overview of the archaeological sites in the Huntington Lake region by Hindes (1962).

In 1984 the site was visited by Ann Dellavalle and Jo Anne Kipps of the Sierra National Forest and the site record was updated (Dellavalle and Kipps 1984); 10 projectile points were surface collected. In 1986 and 1987 Larry Swan and Dolly Stangl of the Forest Service resumed excavations at the site with the help of volunteers consisting of professional archaeologists, archaeology students, Native American individuals, and various Forest Service employees. My Master's thesis is the excavation report for these various archaeological investigations.

METHODS

Nowhere are methods of the investigations by Hindes and the Forest Service explicitly stated. Hindes was interested in finding out how this site fit in archaeologically with other sites located during the 1959 survey. She compared cultural materials recovered from Portuguese Flat with Bennyhoff's (1956) projectile point typology that was based upon materials from Yosemite National Park. She found some similarities in point forms, but also noted that many Portuguese Flat point forms were not found in Bennyhoff's typology. Hindes presented her report "for the purpose of adding to and clarifying the Sierra Nevada occupation picture insofar as possible by comparison of collections from sites in this area with those from related surrounding regions" (Hindes 1962: 1). Dellavalle was interested in identifying the boundaries of the site to protect it during a timber harvest project and updating the site record. Later Forest Service investigations were interested in compiling large amounts of data for the south central Sierra Nevada to use as a comparative basis for subsequent analyses and intersite comparisons.

During the 1986 and 1987 excavations, three topographic distinctions, or loci, were observed: the Midden, the Midden Periphery, and the Flat Loci. The Midden Locus is located on the knoll in the northeastern portion of the site and includes a granite outcrop with bedrock mortars. Midden soils predominate in this locus. The Midden Periphery Locus is located along the gentle slope between the Midden and Flat Loci. The Flat Locus is located across the lower or southwest portion of the site. These loci are important to the distribution analysis of the artifacts recovered from archaeological investigations at this site and will be reintroduced later in this presentation.

For my thesis, artifact distribution analyses were conducted by computerizing the artifact catalog, assigning projectile point type to recognizable specimens, and performing various sorts first by artifact type, then the distribution of artifact types by locus, and by depth . This was done for projectile point types as well as other kinds of materials.

Obsidian hydration and x-ray fluorescence studies were conducted on a sample of the obsidian recovered from this site. Specimens with hydration results are the focus of these distribution analyses. One hundred and fifty-seven hydration rim readings have been measured on 150 specimens. One hundred and seventy-four samples have been sourced. Fifty-five specimens have both hydration and sourcing readings.

RESULTS

There are many projectile point types represented at FRE-137 (Figure 2). The most prevalent projectile points are Rosegate Series, 26.6% of total, and Desert Side-notched, 17.2% of total (Table 1). Results of hydration studies for projectile points and debitage suggest that the average reading for projectile points is later than the average reading for debitage (Table 2). Results from obsidian hydration studies for projectile point types and bifaces are summarized in Table 3. The value of greatest importance for this discussion is the range of hydration readings for

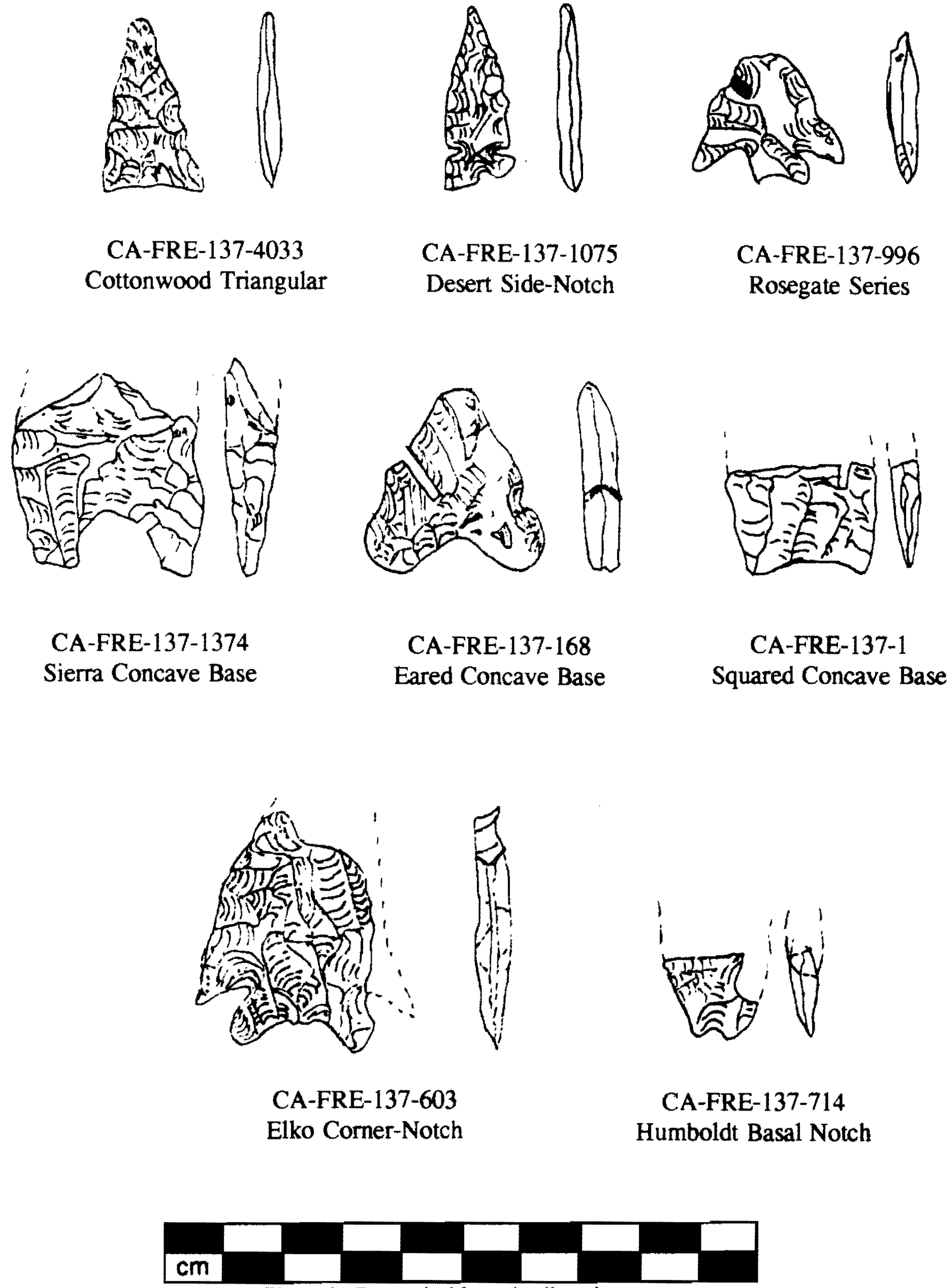

Figure 2. Recognizable projectile point types.

TABLE 1
Summary of Projectile Points

Abbreviation[a]	% of Total[b]	n=	Projectile Point type
CT	7.0	55	Cottonwood Triangular
CT?	0.4	3	possible Cottonwood Triangular
DSN	17.2	135	Desert Side Notch
DSN?	2.0	16	possible Desert Side Notch
ECB	8.7	68	Eared Concave Base
ECB?	1.5	12	possible Eared Concave Base
ECN	0.4	3	Elko Corner Notch
ECN?	0.6	5	possible Elko Corner Notch
ECS	0.3	2	Elko Contracting Stem
ECS?	0.1	1	possible Elko Contracting Stem
EE	3.2	25	Elko Eared
EE?	1.0	8	possible Elko Eared
EES	0.1	1	Elko Expanding Stem
Elko?	0.4	3	possible Elko
ESN	0.6	5	Elko Side Notch
HBN	0.9	7	Humboldt Basal Notch
HCB?	0.1	1	possible Humboldt Concave Base
Hum	0.3	2	Humboldt Series
LSN	1.5	12	Large Side Notch
LSN?	0.6	5	possible Large Side Notch
LT	0.9	7	Large Triangular
LT?	0.4	3	possible Large Triangular
notyp	N/A	759	not typeable
RG	26.6	209	Rosegate Series
RG?	7.6	60	possible Rosegate Series
SCB	7.1	56	Sierra Concave Base
SCB?	4.3	34	possible Sierra Concave Base
SSN	0.9	7	Small Side Notch
SqCCB	4.5	35	Squared Concave Base
SqCCB?	0.6	5	possible Square Concave Base
Total[b]	99.8	1544	

(a) Listed in alphabetical order.
(b) Calculated for only recognizable projectile point types.

Rosegate Series projectile points. There is a pattern with hydration readings for projectile points compared by loci (Figure 3). The Midden Locus has the greatest range in hydration readings. Results from the Midden Periphery Locus show a shorter range of readings which are later in time than the more tightly clustered readings from the Flat Locus. The two readings taken from the Flat Locus have earlier values. The more tightly clustered hydration study results for the debitage support this pattern in all three loci (Figure 4).

DISCUSSION

Typologies used for classification of projectile points from FRE-137 are Thomas (1981) and Moratto (1972). The chronologies referred to in Theodoratus et al. (1984) are the basis for discussions of chronology. Theodoratus et al. (1984) relies heavily on Hester and Heizer (1973) and Bettinger and Taylor (1974). In addition to Theodoratus et al. (1984), I have also referred to Moratto (1984), Kipps (1982), and an unpublished manuscript by Hull (n.d.).

TABLE 2
All Hydration Information Summary

	Mode	Mode	Min*	Max	n=
PPT	2.5	3.0	1.0	11.2	150
Debi-tage	3.5	3.9	0.0/ (1.3)	9.7	245
Com-bined		3.45	0.0/ (1.3)	11.2	395

*Value in parentheses is lowest value greater than 0.

In Figure 5, each projectile point type represented at FRE-137 is placed in a comparative context with the same projectile points types from other chronologies. Not all point types are available from each chronology. Of special note are Rosegate Series projectile points. At FRE-137 Rosegates have a hydration rim reading range of 1.0 to 5.9 microns (Table 4). These are readings for Casa Diablo obsidian, and the approximate calendric equivalents are 130 years to 3300 years before present (Hall and Jackson 1989). Hull's (n.d.) study compares data from a site at El Portal (located at an elevation of approximately 600 meters [2000 feet]) in Yosemite with hydration data from site at higher elevations (over 4000 feet). Results from hydration studies presented in her report have found Rosegate Series projectile points with hydration rim readings between 1.1 and 5.3 microns or 154 to 2725 years before present (Hull n.d.; Hall and Jackson 1989). These results represent the closest range of readings to those from FRE-137. Hester and Heizer suggest Rosegate Series projectile points range from 850 to 1350 years before present (or A.D. 600-1100), Bettinger and Taylor suggest Rosegate Series points range from 650 to 1350 years before present (or A.D. 600-1300). Lanning (1963) suggests 650 to 1450 years before present (or A.D. 500-1300). Moratto (1972) suggests 550 to 1250 years before present (or A.D. 700-1440). Kipps (1982) suggests a range of 500 to 1400 years before present (Table 4).

CONCLUSIONS

This chronological comparison shows that Rosegate projectile points at FRE-137 have, in general, a much larger date range than the other earlier studies in the general area suggest. The hydration results from FRE-137 for these points are both higher and lower (earlier and later) than anywhere else in the area. Some data from Hull's study in Yosemite are an exception (Hull n.d.). Although not as large a range, these data show a similarly wide hydration value range.

There are one or more possible reasons for these results: (1) limitations of obsidian hydration studies biased the findings (R. Jackson 1984; Tremaine 1989), (2) sampling techniques used for both hydration and sourcing studies biased the findings (Hull n.d.; Jackson 1993), and (3) the reuse of obsidian was occurring at both FRE-137

TABLE 3
Biface Hydration Summary[a]

Type	n=	n=[b]	Ave.[c]	Ave.[d]	Mode	Min.	Max.	Min. yrs. b.p.[e]	Max. yrs. b.p.[f]
SCB?	2	2	1.9			1.4	2.3	240	593
DSN	10	19	2.2	1.8(5.1)	2.3	1.1	5.1	154	2540
RG	**59**	**56**	**2.6**	**2.5(5.2,5.9)**		**1.0**	**5.9**	**130**	**3314**
LT	1	1	2.6		2.6	2.6	2.6	742	742
SSN	1	1	2.6		2.6	2.6	2.6	742	742
Biface	10	2	2.6			1.6	3.9	306	3314
HCB?	1	1	3.0		3.0	3.0	3.0	964	964
ECB	29	27	3.1	3(5.5)	3.0	1.4	5.5	240	2915
LSN	4	4	3.2			2.0	4.9	460	2361
EE	2	2	3.4			3.1	3.6	2540	3013
SCB	21	20	3.4		2.5	1.7	5.7	342	3112
ECN	1	1	3.5		3.5	3.5	3.5	2915	2915
RG?	8	7	3.7			2.0	7.5	460	5136
SqCCB	16	15	3.7	3.2(11.2)		2.1	11.2	795	10682
HBN	1	1	4.0		4.0	4.0	4.0	1630	1630
LSN?	1	1	4.0		4.0	4.0	4.0	1630	1630
Total	167	160							

a) Measured in microns and arranged from lowest to highest average.

b) Specimens with readable hydration values including double hydration readings).

c) Average with outliers.

d) Average without outliers (value of outlier).

e) After Hall and Jackson 1989.

Projectile Point Key

Abbreviation	Projectile Point type
CT	Cottonwood Triangular
CT?	possible Cottonwood Triangular
DSN	Desert Side Notch
DSN?	possible Desert Side Notch
ECB	Eared Concave Base
ECB?	possible Eared Concave Base
ECN	Elko Corner Notch
ECN?	possible Elko Corner Notch
ECS	Elko Contracting Stem
ECS?	possible Elko Contracting Stem
EE	Elko Eared
EE?	possible Elko Eared
EES	Elko Expanding Stem
Elko?	possible Elko
ESN	Elko Side Notch
HBN	Humboldt Basal Notch
HCB?	possible Humboldt Concave Base
Hum	Humboldt Series
LSN	Large Side Notch
LSN?	possible Large Side Notch
LT	Large Triangular
LT?	possible Large Triangular
notyp	not typable
RG	Rosegate Series
RG?	possible Rosegate Series
SCB	Sierra Concave Base
SCB?	possible Sierra Concave Base
SSN	Small Side Notch
SqCCB	Squared Concave Base
SqCCB?	possible Square Concave Base

(a) Listed in alphabetical order.

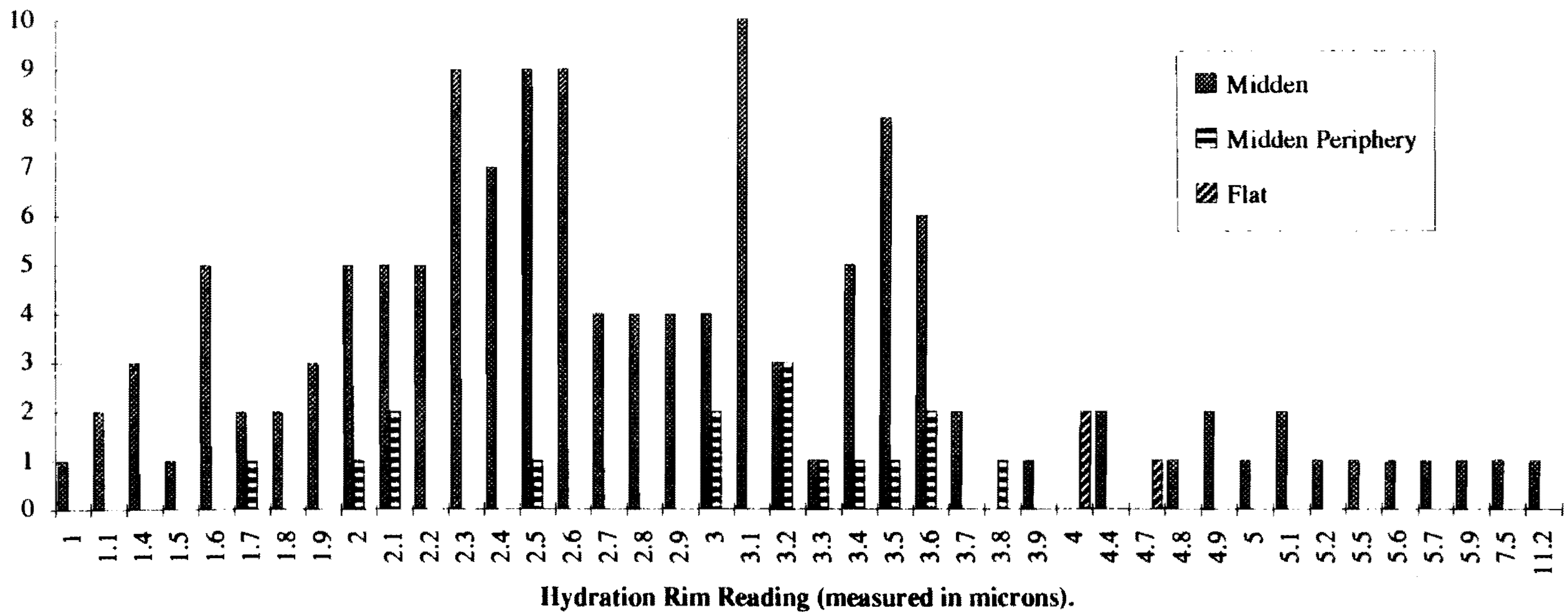

Figure 3. All projectile point hydration rim readings by loci.

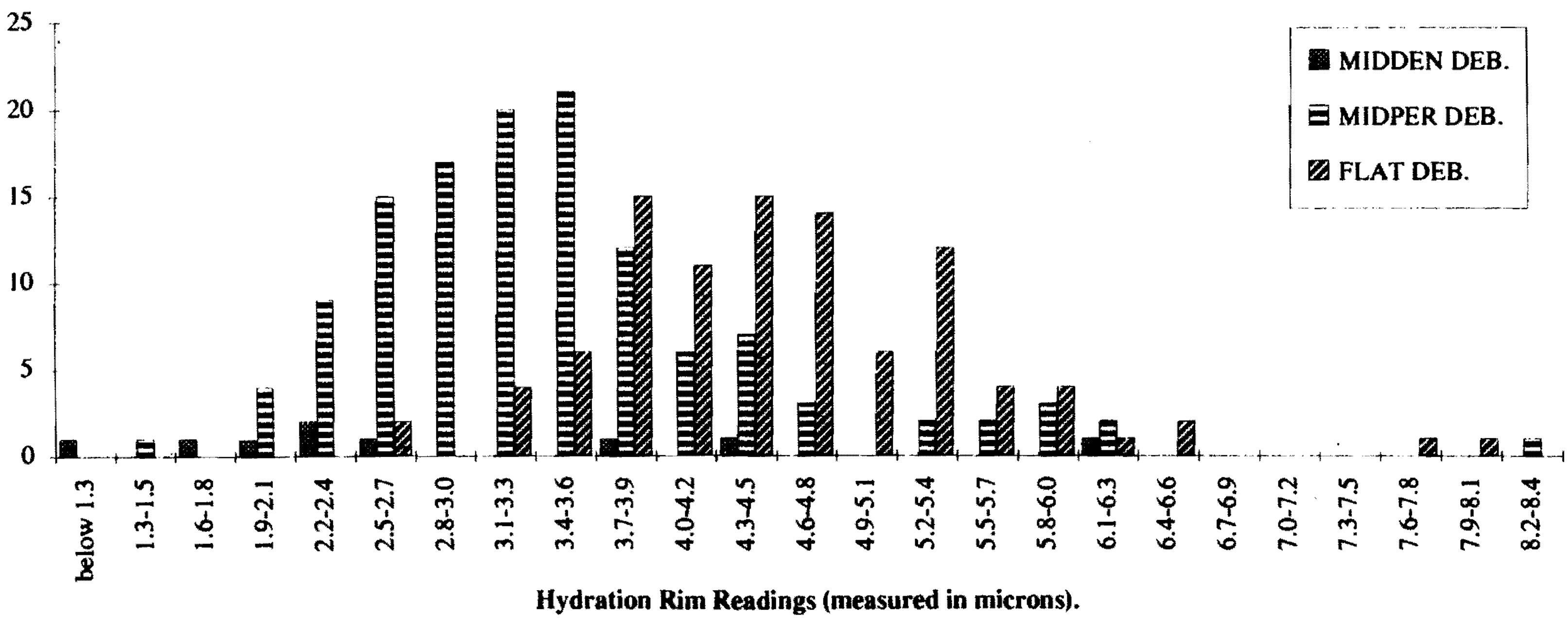

Figure 4. Debitage hydration rim readings by loci.

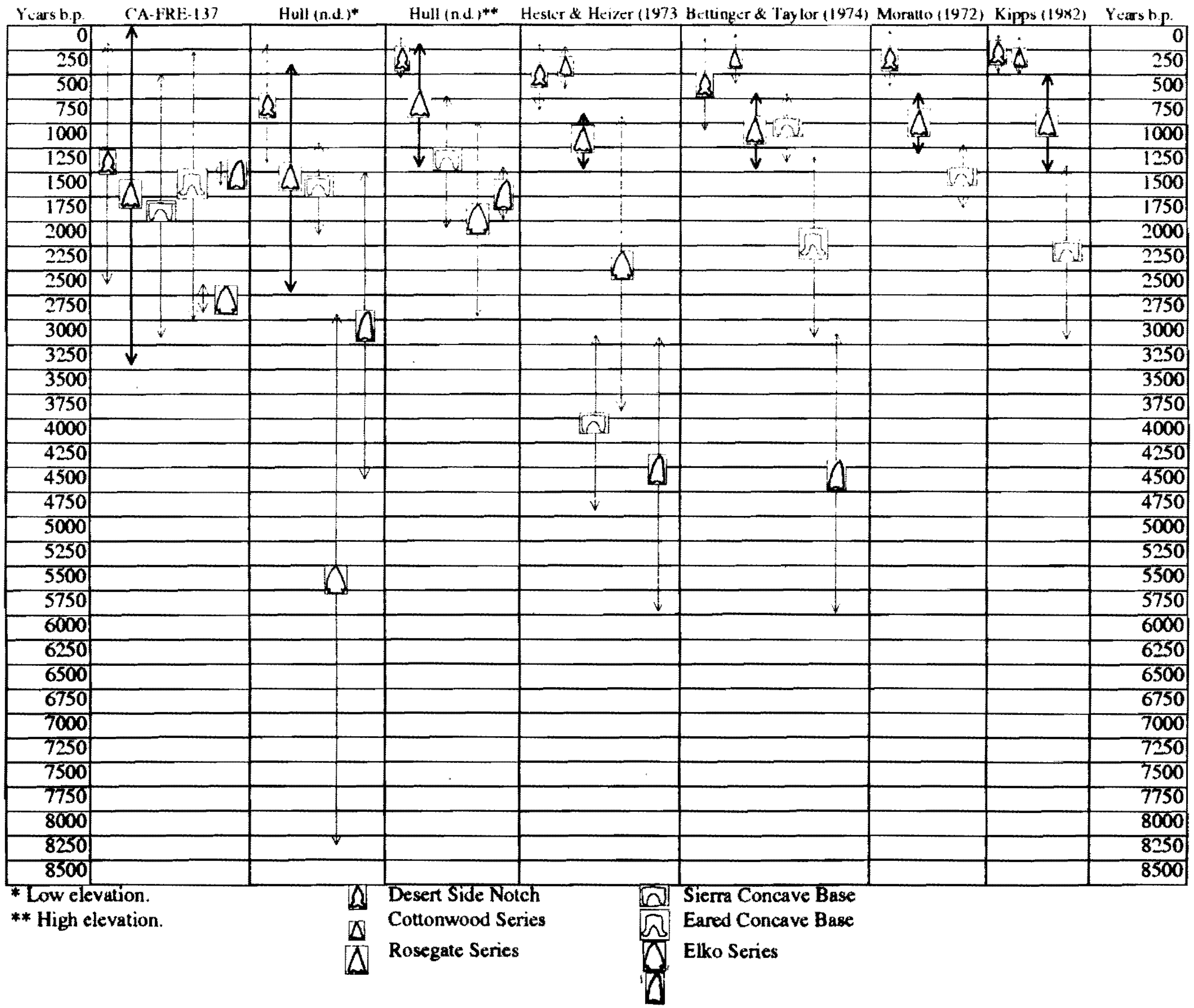

Figure 5. Comparative chronologies.

TABLE 4
Rosegate Series Date Ranges

Citation*	Microns	Calendric Date b.p.	Interval	Ratio**
FRE-137	1.0 to 5.9	130 to 3300	3170	1
Hull (n.d.) low elev.	1.7 to 5.3	342 to 2725	2383	.75
Hull (n.d.) high elev.	1.1 to 3.7	154 to 1414	1261	.4
Kipps (1982)	N/A	500 to 1400	900	.28
Lanning (1963)	N/A	650 to 1450	800	.25
Bettinger and Taylor (1974)	N/A	650 to 1350	700	.22
Moratto (1972)	N/A	550 to 1250	700	.22
Hester and Heizer (1973)	N/A	850 to 1350	500	.16

* In order of similarity to FRE-137 range.
** Ratio of interval to FRE-137 interval.

and Hull's study area. I suggest that although the first three possibilities may occur, the results demonstrate predominantly the reuse of obsidian at FRE-137.

The variables affecting the hydration of glass have been recently discussed in R. Jackson (1984) and more relevantly by Tremaine (1989). One of the most interesting and problematic variables being considered in archaeological methods today is inter-source hydration rate variability, in general, and, more specifically, the suitability of converting microns to calendar dates. Casa Diablo obsidian samples were used for most of the hydration studies at FRE-137. This was done to increase intrasite consistency for comparisons and analyses. However the comparison of hydration rim readings between sources is still problematic due to the potential differences in rate of hydration between these sources. Less significant as a bias is how relative humidity and soil temperature affect obsidian's rate of hydration. Tremaine (1991:280) suggests the variables of relative humidity and temperature may cancel each other out at some localities.

Another factor that may affect the results of hydration and sourcing studies at FRE-137 is the sampling technique that was employed for these special studies. Projectile point frequencies of the sample for these studies do not reflect the overall projectile point frequencies on the site (T. Jackson 1993; Table 2). Future studies using materials from this site may complement the current sample to ensure the hydration rim reading pattern for the Rosegate (RG) Series is unique and does not occur for the other projectile point types as well. Even though almost all the projectile point types were tested, the total number of some of these point types is too small to offer much information (Table 1). This bias could be compensated for by making the frequencies with which projectile point types are tested similar to the percentages at which the types occur at the site.

Evidence of reuse of obsidian is present in the FRE-137 archaeological collection in the form of rejuvenated projectile points, projectile points produced on flake blanks and two hydration rim readings on one specimen. Rejuvenated projectile points have reworking on one or both of their faces and possibly an incurvate margin plan. These attributes demonstrate reworking of the blade element. Of a small sample of the recognizable points (n=269), 14 (or 5% of the sample) were reworked on one face, 98 (or 36%) were reworked on both faces, and 157 (or 59%) were either not reworked or reworking could not be determined. RGs represent 29% of this sample (n=77). Of these, three (4%) were reworked on one face, 22 (29%) were reworked on both faces and 52 (68%) had no or indeterminate reworking.

Fourteen (5% of the total sample) demonstrated rejuvenation in the form of an incurvate margin plan (Figure 2; FRE-137-168). RGs made up 50% of these (n=7). DSNs made up 36% of the sample (n=5) and the remainder were CTs. The use of flake blanks shows reuse by suggesting reduction of large flakes (previously discarded through the manufacture of large bifaces) into smaller bifaces. Incomplete or marginal dorsal scar morphology was noted on the sample. Projectile points potentially made of flake blanks number 18. Five of these were RGs, three were CTs and one was a DSN. There were an additional 14 projectile points that had nearly complete dorsal scar morphology. These may also be flake blanks.

In addition to morphological analyses, it also can be argued that obsidian hydration studies may help determine evidence of reuse. A second hydration rim reading is possible evidence of reuse of obsidian. That is, a second reading may demonstrate another episode of reduction. Of all the hydration specimens, 24 have double hydration rim readings. Half of these are interior flakes and the other half are projectile points. A third of these are RGs (Table 5).

The value of these results at FRE-137 are significant. Not only do these results cause us to seek answers to questions of time of use at the site, but also to ask questions of obsidian hydration studies and prevailing methodology as well as the overall effectiveness of using Rosegate Series projectile points as a time marker in this area of California. The analyses from FRE-137 demonstrate an interesting and unique pattern in the archaeological data. Through the analysis and reanalysis of previously collected archaeological specimens, new and substantive information can be gleaned.

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TABLE 5

Double Hydration Rim Readings by Type

Catalog #	Unit	Locus	Depth (cm)	Type	Band 1	Band 2	Remarks*
137-4625	M4	MP	30-40	Flake	2.4±0.1	3.2±0.2	-----
137-4482	13	F	60-70	Flake	2.7±0.2	1.7±0.1	-----
137-4617	M4	MP	30-40	Flake	2.7±0.2	4.1±0.3	HV
137-4593	M3	MP	30-40	Flake	2.8±0.2	3.5±0.2	-----
?(ohl#204)	13	F	100-110	Flake	3.5±0.2	4.3±0.2	HV
137-4628	M4	MP	30-40	Flake	4.0±0.2	3.0±0.2	-----
137-4567	M1	MP	30-40	Flake	4.4±0.3	3.5±0.3	-----
137-4533	13	F	140-150	Flake	4.8±0.1	4.3±0.1	-----
137-4566	M1	MP	30-40	Flake	4.8±0.3	3.9±0.3	HV DIS
137-4560	M1	MP	0-10	Flake	6.3±0.2	5.1±0.3	HV
137-4456	13	F	20-30	Flake	7.8±0.5	9.3±0.3	HV
137-4457	13	F	20-30	Flake	7.9±0.2	9.7±0.3	HV
137-1220	20N5E	M	0-10	DSN	5.1±0.3	1.5±0.3	-----
137-575	87-2	M	30-40	ECB	2.1±0.2	3.0±0.1	-----
137-141	N20E22.7	M	20-40	RG	2.1±0.2	5.9±0.1	-----
137-572	M2	MP	30-40	RG	3.4±0.2	2.5±0.3	HV
137-573	87-2	M	30-40	RG	3.5±0.2	2.5±0.2	-----
137-1285	N20E6	M	0-10	RG	4.8±0.3	2.0±0.1	-----
137-1720	N20E8	M	50-60	RG?	2.4±0.1	7.5±0.3	-----
137-157	N20E22.7	M	20-40	RG?	3.4±0.2	2.7±0.1	-----
137-1540	N20E8SW	M	20-30	SCB	2.5±0.2	1.7±0.1	-----
137-779	N20E15W	M	0-20	SCB	5.7±0.1	5.0±0.3	DIS DFV
137-1800	BRM	M	surface	SqCCB	3.1±0.1	2.5±0.2	-----
137-81	N20E22.7	M	0-20	SqCCB	5.1±0.2	11.2±0.5	HV

*HV = Highly Variable; DIS = Discontinuous; DFV = Diffusion Front Vague

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