

## SPATIAL AND TEMPORAL DISTRIBUTION OF ROSE SPRING PROJECTILE POINTS IN THE NORTH-CENTRAL SIERRA NEVADA

RICHARD W. DEIS

*Rose Spring corner-notched projectile points have been used within the North-Central Sierra Nevada region primarily to date surface assemblages, in an attempt to develop temporal affinities between sites and to trace technological innovation (i.e. introduction of the bow and arrow). Temporal placements have primarily been based upon projectile point cross-dating using typologies established for the Great Basin, without regard for a demonstrated link to this region of study. This paper presents the results of analysis that addressed the utility of Rose Spring corner-notched points as temporal markers, and presents implications for the results of this study.*

Rose Spring corner-notched projectile points have been used within the North-Central Sierra Nevada region to date surface assemblages, in an attempt to develop temporal affinities between sites and to trace technological innovation, i.e. introduction of the bow and arrow. Temporal placements have primarily been based upon projectile point cross-dating using typologies established for the Great Basin, without regard for a demonstrated link within the study region.

This paper briefly summarizes more extensive research presented in an MA thesis of the same title (Deis 1999). The reader is referred to this document for supporting data and details of statistical analyses referred to in this paper. The purpose of this study was to develop a comparative data base of small corner-notched projectile points from excavated sites in the western Great Basin and then use qualitative and quantitative descriptions of artifact assemblages, applying statistical analysis, and temporal associations to assess the utility of this artifact type as a valid temporal marker within the north-central Sierra Nevada. For this study the north-central Sierra Nevada is defined as extending from the northern limit of the Sierra Nevada range, identified as Fredonyer Pass to the Stanislaus River drainage in the south. Hydrologic drainage basins were used to subdivide the study area into seven sub-regions depicted in Figure 1. Six of these are defined by major westerly trending drainage systems that bisect the area of study from east to west (Feather, Yuba, American, Cosumnes, Mokelumne and Stanislaus River drainages), while the seventh encompasses the Eastern Sierra Nevada and portions of three east flowing river systems (Truckee, Carson and Walker

Rivers) which are located along the eastern margin of the project area.

### TYPE CONCEPT AND DEVELOPMENT OF TYPOLOGIES

Definitions of types used in this study are according to Steward (1954) who defined these in terms of morphology, historical significance, functional traits or cultural characteristics. Morphological types are the most basic and consist of descriptions of form or visually observed characteristics, which are used when the cultural significance of an object is unknown. Historical-index types have chronological meaning, but do not necessarily have cultural significance. These are the temporal or chronological markers that were referred to as "type" by Ford (1954) and Spaulding (1953). On the other hand, functional types have cultural meaning. Steward expanded upon this definition. He acknowledged that types must be defined in morphological and historical-index terms in order to place them in both time and space, while stressing that the definition must be in functional terms that can be of value in "reconstructing culture history".

### Seriating Arrow Points From Dart Points

As far as defining Rose Spring points in the study area, several problems exist. First of all, clear distinctions have not been made as to exactly what Rose Spring points are and what they are not. A second problem relates to the use of quantitative keys that combine the Rose Spring and Eastgate styles into the Rosegate classification. While the Rosegate

classification works well in Central Nevada, evidence has not been presented indicating that this relationship holds for the Sierra Nevada. Lastly temporal placement of small corner-notched points has been primarily based upon datable associations which exist outside the Sierra Nevada, without evidence to indicate that such a relationship exists.

Ample evidence, both archaeological and ethnographic, exists for the technological shift from darts to arrows, and many researchers have alluded to a decrease in projectile point size through time, and interpreted this reduction as a reflection of the replacement of atlatl and dart technology with the bow and arrow. Segregation of the artifact types has primarily been based upon experimentation or statistical analysis of functional attributes. While some studies (VanBuren 1974; Fenenga 1953) have relied upon weight to seriate dart points from arrow points, others (Thomas 1978; Patterson 1985; Fawcett and Kornfeld 1980) indicate that attributes of basal morphology, which are reflected in shoulder angles, neck width, width of base, and maximum width, all of which are also reflected in the weight of the specimen, more accurately divide these two artifact types. However, it appears that there is no one set of traits that may be used from region to region to define dart points from arrow points. For example thickness, neck width, and weight work well on the north Texas coast (Patterson 1985), neck width has been found to be a determining factor in Idaho (Corliss 1972), and shoulder width, as applied to museum collections, may be a definitive trait in southern Nevada (Shott 1997). So where does this leave us, does it mean that seriation of arrow and dart points is merely a matter of intuition? Thomas (1978:466) suggests that the best perspective is one based upon empirical evidence and not a theoretical question. Therefore, based upon evidence presented thus far an empirical study focusing on basal attributes derived from a large sample, should be able to separate arrow points from dart forms, and is the approach taken in this study.

Based upon excavations and analyses at CA-INY-372, Lanning (1963:252) defined the Rose Spring type as primarily corner-notched, with contracting-stem and side-notched variants also present. Subsequent analysis of the assemblage from INY-372 by Thomas (1981), and later by Yohe (1992) indicates that with the possible exception of one specimen, side-notched variants do not occur at INY-372 and are, therefore, not a viable subtype. Similarly, a visual inspection of photographs of the Rose Spring collection from INY-372 indicates that with the exception of two specimens of the 141 artifacts examined, all display straight to expanding stems. Therefore, for this study it appears

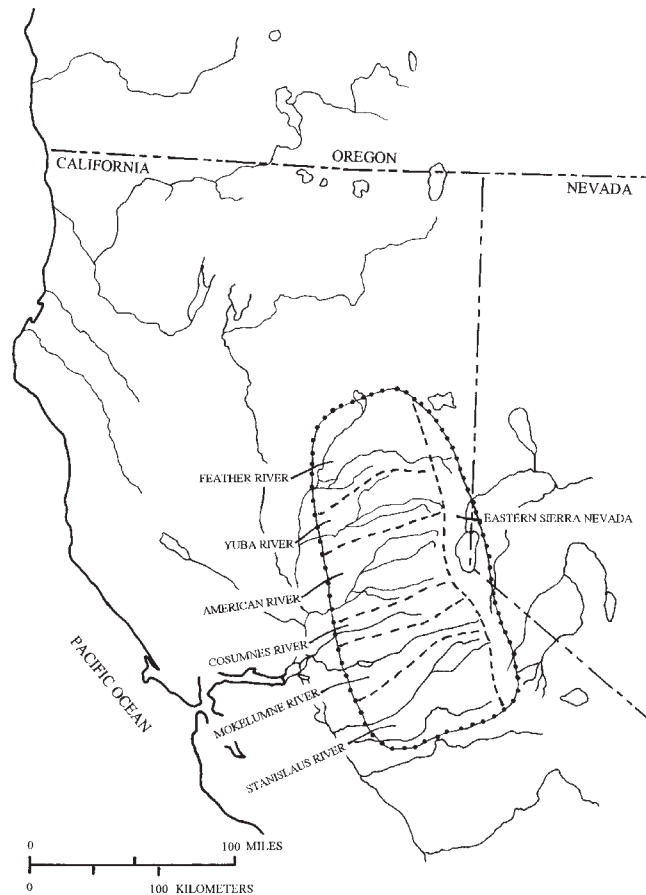


Figure 1: Study area.

that the contracting stem form also occurs in a very small percentage of the assemblage that is dominated by expanding stem forms.

Another dilemma that adds to the confusing of point types is the separation of Rose Spring and Eastgate forms into the Rosegate classification. Thomas combined the Rose Spring and Eastgate forms into what he designated Rosegate. A distinct morphological difference exists between these two point types. The Eastgate type is basally-notched as opposed to the corner-notched Rose Spring type. Additionally, the Eastgate forms are generally thinner and exhibit square barbs, straight blade margins, and a smaller length to width ratio. The Rose Spring style, which is relatively thin and narrow, exhibits convex or straight blade elements and stems that are expanding to straight with predominately convex proximal ends (although straight bases are also present). Further, the Eastgate type appears to be primarily limited to the central and eastern Great Basin. Thomas (personal communication 1997) suggests that the Eastgate point may be a Fremont style artifact, which seems to be congruent with findings in the western Great Basin, where evidence of a Fremont influence is lacking, and where only two Eastgate forms are present at INY-372.

However, Mark Basgall indicates that they represent 15 to 20 percent of the Haiwee Period projectile point assemblages at some sites in the Inyo-Mono region (Mark Basgall, personal communication 1999). Based upon the above discussion it seems reasonable that if basally-notched forms are present in the western Great Basin and Sierra Nevada, they are most likely limited in numbers and distribution.

## DEVELOPMENT OF COMPARATIVE DATA BASE

An assessment of the distribution of Rose Spring points within the north-central Sierra Nevada required the development of a comparative data base that defines attributes and the temporal time frame in which artifacts with those attributes occur.

### Quantitative and Morphological Attributes

The first step in developing a comparative data base was the establishment of quantitative and morphological attributes that define Rose Spring point types. These attributes are similar to those outlined by Lanning (1963) at INY-372, Thomas (1981) for the central Great Basin and Drews (1986) for the western Great Basin, consisting of:

- Width of base less than or equal to 10 mm
- Thinned proximal margins
- Convex to straight blade margins
- Downsloping to slightly upsloping shoulders
- Expanding to straight stems

For the comparative data base a total of 186 small corner-notched points were selected from 16 excavated sites along the western edge of the Great Basin, from Surprise Valley in the north to Carson City at the south. Criteria used in selecting these locales were that each contain a large collection of small corner-notched points and/or possess temporal data in direct association with Rose Spring style points. With the exception of one site, all of the artifacts were reexamined and the following quantitative measurements were recorded.

- Maximum length,
- Axial length
- Maximum width

- Thickness
- Weight
- Width of base
- Neck width
- Distal shoulder angle
- Proximal shoulder angle
- Notch opening angle (distal shoulder angle minus proximal shoulder angle)
- Maximum width/width of base.

Using these attributes this sample was compared with attributes for 141 small corner-notched points recovered at CA-INY-372, and 46 specimens from the Monitor Valley. A one-tailed t-test was used to assess the null hypothesis that the observed difference in the means for each attribute was a matter of sampling error and that the samples represent the same population. For artifacts from INY-372, the null hypothesis was rejected for each attribute, whereas comparison with the Monitor Valley assemblage did not result in rejection of the null hypothesis for proximal shoulder angle, thickness, the computed maximum width to base ratio, and possibly width of base at a significance level of 0.5. Interestingly, proximal shoulder angle and thickness are the two attributes which Beck (1998) outlined as being under selection in the production of small arrow points in the Great Basin, and tends to indicate a continuity between the comparative data in the western Great Basin and that which defines small corner-notched projectile points in central Nevada, and throughout the Great Basin.

On the surface, the results between the comparative data and points from INY-372 suggest that variability in the production of small corner-notched points exists in the western Great Basin and that the same metric criteria do not accurately define all populations. Material type, flaking techniques, tools, and skill of the maker may be factors in this variability. Taking another approach Eerkens and Bettinger (1996) have suggested that it is the result of the classification system, where weight is more effective in seriating Rose Spring corner-notched points from the larger Elko forms in the Owens Valley. Another possibility is that it may be a result of methods. At the Rose Spring site, Elko and Rose Spring points were intuitively separated and evidence for this division was a scatter diagram of the relationship between width and length. On the other

hand, this study used basal attributes and morphology to separate the collection of dart and arrow points.

As a test of reliability of the comparative data in seriating dart points from arrow points, the means of the attributes for the comparative collection and the mean measurements of an assemblage of 85 Elko corner-notched points, recovered from 14 of the 16 comparative sites, were subjected to a one tailed t-test. The null hypothesis, suggesting that there is no distinct difference in the means associated with each group was rejected by a significant margin, at the 0.01 significance level in all cases, with the exception of the distal shoulder angles for each type. Therefore, the results indicate a clear break in the attributes between Elko and Rose Spring forms at 14 of the 16 sites encompassed by the comparative data, indicating that there is a strong possibility they represent two distinct populations.

Based upon these analyses the quantitative attributes that define 95 percent of the population (within two standard deviation units of the mean) are:

- Maximum Length 35.3-15.3 mm
- Axial Length 35.0-15.0 mm
- Maximum Width 20.0-9.2 mm
- Maximum Thickness 5.2-2.0 mm
- Weight  $\leq 2.0$  g
- Basal Width 10.6-4.6 mm
- Maximum Width/Width of Base 3.0 – 1.0 mm
- Neck Width 9.0 – 3.8 mm
- Distal Shoulder Angle 197–115 degrees
- Proximal Shoulder Angle 137–82 degrees
- Notch Opening Angle  $\leq 95$  degrees

#### TEMPORAL PLACEMENT OF COMPARATIVE DATA

Temporal data from the 16 sites is based upon association of Rose Spring points with radiometrics which suggest that the point form first appears around 1730 B.P., is well established by 1400-1350 B.P. and extends at least until 775 B.P. and possibly as late as 350 B.P. This time frame is similar to the accepted

1400-600 BP time span and is substantiated by mean hydration data for 98 points which resulted in a value of 824 BP for those produced from the Bordwell Spring source, and 1346 BP for specimens with similar fingerprints of the South Warners sources.

#### ROSE SPRING POINTS LOCATED IN THE SIERRA NEVADA RANGE

Having developed a comparative data base we now turn to evidence for the validity of Rose Spring corner-notched projectile points as a temporal marker within the north-central Sierra Nevada. This evidence is extracted from data generated by previous investigations which have taken place over a period of 35 years within the seven sub-regions, and consists of the statistical analysis of qualitative and quantitative descriptions of artifact assemblages using one-tailed t tests, and temporal associations in the form of shell beads, radiocarbon analyses, and relative and absolute chronological placement using obsidian hydration values.

It must be noted that this investigation was hampered by the lack of single component sites, small sample sizes, and archaeological deposits that are vertically mixed and represent broad time frames. In addition, in the majority of cases, temporal controls and associations are seriously lacking, limited to a few radiocarbon dates, shell beads, and hydration data for specific artifact types. Finally, this study relied on previous investigations, which do not necessarily represent an unbiased sample from all portions of the study area. Nevertheless, these data appear to show patterns and trends that may be used to develop preliminary interpretations and guide further investigations.

As mentioned earlier for any artifact to be considered a temporal marker it must possess distinctive attributes that separate it from other forms, and also be representative of a particular time frame. The focus of this comparison was basal attributes, which are least subject to modification through reworking.

Table 1 presents very general summary data for the comparative data base in the western Great Basin and each sub-region within the area of study. Results indicate that non-basalt assemblages of corner-notched points, from the eastern Sierra Nevada sub-region and the Oroville locale included in the Feather River drainage, exhibit mean basal attributes that are not significantly different from the sample of Rose Spring points from the western Great Basin. For

Region	n Rose Spring	n Contracting Stem Points	Associated Temporal Data (B.P.)	Dated Occupations
Western Great Basin	185	6	1400-775	-
Eastern Sierra Nevada	47	2	547 and 815	-
Feather River	16	59	632, 432, and 1250-1050	1050-450
Yuba River	3	107	-	1274-841
American River	2?	65	-	1064-831
Cosumnes River	-	57	986	1413-595
Mokelumne River	-	15	-	2450-940
Stanislaus River	-	6	-	1583-450

Table 1: Summary of study area distribution patterns.

example, within the Oroville locality, corner-notched points identified as Type 15 by Bethard (1988) and Type A5 by Ritter (1968), exhibit stems that are slightly wider than the comparative assemblage. The attribute means for proximal shoulder angle and thickness, the two attributes that appear to distinguish this artifact type from other corner-notched forms, are not significantly different from the comparative sample.

Further to the south, the frequency of corner-notched points morphologically similar to the Rose Spring corner-notched type is either extremely limited in numbers or completely absent. Only 3 of 110 arrow points from NEV-407 in the Yuba River drainage and possibly two artifacts from Forest Service site 56-730 in the American River drainage displayed attributes consistent with the comparative sample. In both cases, these expanding-stem specimens occur in extremely small frequencies and cannot be considered a primary point form in these areas, which are dominated by small contracting-stem barbed points. Further to the south, in the Cosumnes, Mokelumne and Stanislaus River drainages these forms are missing entirely from the analyzed assemblages. Therefore, morphologically, the Rose Spring form appears to be a valid type east of the Sierra Crest, the small numbers in the Oroville locality may be a variation of a local form, and at all other locations they occur in too few numbers to serve as reliable markers.

While occupations can be dated, through radiometric data and obsidian hydration, to a similar time period represented by the comparative collection, directly associated temporal data are severely lacking, limited to three obsidian hydration

readings and association with D1 *Olivella* beads at BUT-84. Therefore, as a temporal marker the Rose Spring corner-notched point in the eastern Sierra Nevada sub-region may be associated with a similar time frame as established for the western Great Basin, it may represent a protracted period of time in the Oroville locality; however, it is most likely not a useful temporal marker in the remainder of the study area.

## IMPLICATIONS

There are several implications of this study, including:

- Group boundaries
- Variability of artifact forms related to material type
- Use of small contracting-stem points
- Possible decrease in land-use within the Stanislaus drainage between 1400-1000 BP

Adoption of bow and arrow technology in the Great Basin, as marked by the presence of small corner-notched projectile points, was relatively rapid; most likely because of the superiority of this technology over the atlatl and dart system. If the western slope of the Sierra Nevada was within the range of groups to the east, it seems reasonable that the Rose Spring corner-notched point would be present in greater numbers within the study area. However, with the exception of the eastern Sierra Nevada and possibly the Feather River drainage, the introduction of small corner-notched points does not appear with any great frequency. This tends to



indicate that Great Basin groups did not regularly utilize the western slopes and that California groups adopted the technology or functional trait (i.e., bow and arrow technology), but with stylistic variations, such as the small contracting-stem points which seem to appear at about or slightly later than the corner-notched varieties in the western Great Basin. Beck (1998:24) suggests that stylistic variations may mirror demographic boundaries, indicating that the Sierra crest may have served as a formidable boundary between these two groups at this time.

When basalt artifacts were included in the assemblage for the eastern Sierra Nevada, there were significant differences in all of the mean measurements, with the exception of distal shoulder angle. However, when these specimens were omitted from the comparison, there was no significant difference between mean measurements and those of the comparative data. This suggests that variation between certain point types (i.e. Martis forms and Elko types) may be as much a result of material type, as a function of technological or temporal variability.

Regarding the use of small contracting-stem points, morphological differences in the basal elements of these forms (such as contracting with barbs, pointed stem with exaggerated barbs) may be indicative of either temporal periods or cultural affinity, or both.

Within the Stanislaus River drainage, this study, and work of other researchers appears to indicate limited occupation, with few associated projectile points between approximately 1400-1000 BP. Additional study may show that this was a period of protracted usage within this region.

CONCLUSION

This study has revealed the need to discover single component sites, with large assemblages of contracting-stem or corner-notched points, that date to approximately 1400-600 BP. Investigation at these sites should be geared to the recovery of artifact assemblages with good radiometric associations. It is only through the use of rigorous field methods, careful attention to stratigraphic context, identification of lithic material sources, and detailed analyses, that meaningful artifact chronologies can be developed.

.....

REFERENCES CITED

Basgall, Mark E.  
1999 Personal Communication.

Beck, Charlotte  
1998 Projectile Point Types as Valid Chronological Units. In *Unit Issues in Archaeology*, pp. 21-40, Ann F. Ramenofsky and Anastasia Steffen, eds. University of Utah Press, Salt Lake City.

Bethard, Kenneth Randall  
1988 *A Projectile Point Typology for Archaeological Site CA-BUT-301, An Exogene Cave in the Northern Sierra Foothills*. Unpublished Masters Thesis, Department of Anthropology, California State University, Sacramento.

Corliss, David W.  
1972 Neck Width of Projectile Points: An Index of Culture Continuity and Change. *Occasional Papers of the Idaho State University Museum* 29.

Deis, Richard W.  
1999 *Spatial and Temporal Distribution of Rose Spring Projectile Points Within the North-Central Sierra Nevada*. Unpublished Master Thesis on file at California State University, Sacramento.

Drews, Michael P.  
1986 Projectile Points. In *The Archaeology of the Vista Site 26WA3017*. C. D. Zeier and R. Elston, eds., Intermountain Mountain Research, Silver City, Nevada.

Eerkens, Jelmer and Robert L. Bettinger  
1996 Typologies, Points, and Social Transmission: The Elko to Rosegate Transition. Paper presented at the 1996 Great Basin Archaeological Conference, Lake Tahoe, NV.

Fawcett, William B and Marcel Kornfeld  
1980 Projectile Point Neck Width, Variability and Chronology on the Plains. *Wyoming Contributions to Anthropology* (2):66-79.

Fenenga, Franklin  
1953 The Weights of Chipped Stone Points: A Clue to Their Functions. *Southwestern Journal of Anthropology* 9:309-323.

- Ford, J. A.  
1954 On the Concept of Type. *American Anthropologist* 56:42-111.
- Lanning, Edward P.  
1963 Archeology of the Rose Spring Site INY-372. *University of California Publications in American Archaeology and Ethnology* Vol. 49, No. 3, Berkeley
- Patterson, Leland W.  
1985 Distinguishing Between Arrow and Spear Points on the Upper Texas Coast. *Lithic Technology* (14):2 p. 81-89.
- Ritter, Eric W.  
1968 *Culture History of the Tie Wiah, 4-But-84, Oroville Locality, California*. Ms. on file California Department of Parks and Recreation, Sacramento, California.
- Shott, Michael J.  
1997 Stones and Shafts Redux: The Metric Discrimination of Chipped-Stone Dart and Arrow Points. *American Antiquity* 62(1), pp. 86-101.
- Spaulding, Albert C.  
1953 Statistical Techniques for the Discovery of Artifact Types. *American Antiquity* 17(4), pp. 305-313.
- Steward, Julian H.  
1954 Types of Types. *American Anthropologist* 56, pp. 54-57.
- Thomas, David H.  
1978 Arrowheads and Atlatl Darts: How the Stones Got The Shaft. *American Antiquity* 43:(2) pp. 461-472.  
1981 How to Classify the Projectile Points from Monitor Valley, Nevada. *Journal of California and Great Basin Anthropology* 3(1): 7-43.  
1997 Personal Communication
- VanBuren, G. E.  
1974 *Arrowheads and Projectile Points*. Arrowhead Publishing, Garden Grove, California.
- Yohe, Robert M.  
1992 *A Reevaluation of Western Great Basin Cultural Chronology and Evidence for the Timing of the Introduction of the Bow and Arrow to Eastern California Based on New Excavations at the Rose Spring Site (CA-INY-372)*. Unpublished Ph.D. Dissertation, University of California, Riverside.