

UNIVERSITY OF CALIFORNIA  
Los Angeles

**TYPOLICAL ANALYSIS OF PROJECTILE POINTS  
RECOVERED FROM EXCAVATIONS  
ON VANDENBERG AIR FORCE BASE,  
SANTA BARBARA COUNTY, CALIFORNIA**

A Master's Paper submitted in partial satisfaction of the  
requirements for the degree Master's in Archaeology

by

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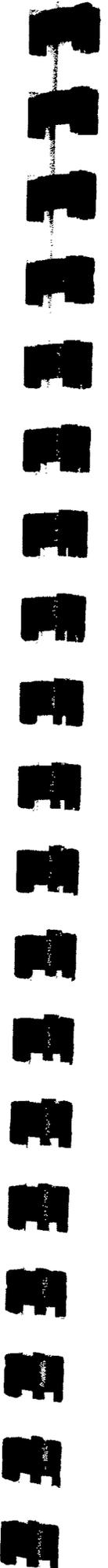
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## ABSTRACT

A collection of projectile points and bifaces recovered during excavations on Vandenberg Air Force Base, Santa Barbara County, California was analyzed with respect to morphological attributes and temporal sensitivity of defined types and subtypes. Attributes used in this analysis were based on the system devised by Thomas (1970, 1981) during analysis of projectile points recovered from excavations and surface collections in Monitor Valley, Nevada. The values of these attributes were used to assign Vandenberg projectile points to one of nine types using a dichotomous key. Point types were further divided into subtypes using additional attribute values.

Each subtype is described with regard to morphology, material, provenience, and comparable specimens located within the Santa Barbara Region and adjacent areas. For the purposes of this analysis, adjacent areas included southern California coastal and desert regions, the Great Basin, and California's Central Valley, Sacramento Delta, and Sierra Nevada Mountains. Subtypes are discussed with relation to temporal data from these areas.

Type and subtype assignments, along with their respective temporal correlates, allowed placement of specimens into a chronological framework. The confidence of chronological assignments varied greatly as a result of sample size, comparable forms, and availability of temporal data.



## INTRODUCTION

This paper reports the results of an attribute based, morphological analysis with respect to temporal sensitivity of defined biface types. The sample represents specimens recovered from excavations and surface collections undertaken by the University of California, Santa Barbara and the archaeological staff of Vandenberg Air Force Base. Specimens collected represent those recovered from 87 sites, and a number of isolated contexts, located on Vandenberg Air Force Base, Santa Barbara County, California (Table 1, Figure 1). Excavations and surface collections were undertaken as part of a plan to mitigate negative impacts on archaeological sites located on the base. These impacts resulted from construction of facilities attendant to Space Shuttle and MX Missile operations. The major portion of the archaeological work was carried out during 1976. The final report was issued in 1990 (Glassow *et al* 1990). The present paper represents an expanded version of the biface analysis undertaken for the final report (Glenn 1990).

## METHODOLOGICAL FOUNDATION

Methodology used during this analysis is derived primarily from Thomas (1970). He sought to operationalize objective definitions of preexisting intuitive projectile point types found in the Great Basin. To this end, he constructed a dichotomous key with which to evaluate and classify projectile points. Thomas' study worked within the framework of previously defined types with many preconceptions regarding spatial and chronological distributions. These preconceptions were formulated through close work with Great Basin research projects carried out by R. F. Heizer of the University of California, Berkeley and his students, who defined many Great Basin types.

The objective type and subtype definitions presented in the current analysis reflect morphological forms that have been previously, albeit intuitively, identified by the author and other investigators (Rogers 1929; Carter 1941; Orr 1968; Hoover 1971; Greenwood 1972; Glenn n.d.). Assignments are made employing a dichotomous key developed by the author during a previous study (Figure 2)(Glenn n.d.:Figure 2). The key represents divisive criteria using attribute values and states (Table 2). The key was formulated in a manner which resulted in the assignment of specimens to one of nine major types. Further evaluation of assigned type specimens resulted in subtype assignments. This was accomplished using type specific attributes.

Specimens failing assignment to the type level were coded according to the last successful juncture completed. Those specimens failing the first to complete the first juncture of the key were, where possible, assigned to one of three gross levels based on size, i.e., small, medium, and large biface. Assignment to these gross size categories was based on cursory assessment of fragment size, thickness, and blade curvature. Specimens not classified to the type level were eliminated from consideration during this analysis. Of the 777 specimens in the Vandenberg collection, 269 completed the key to the type level (Table 3).

Table 1. List of Vandenberg sites with projectile point counts.

Site Number	Total Count	Typed Specimens	Site Number	Total Count	Typed Specimens
Isolates	129	15	702	1	0
207	1	1	705	1	0
208	7	2	710	1	2
209	12	10	712	3	1
210	314	91	715	1	0
214	1	1	717	1	1
215	2	2	718	1	0
225	3	0	725	1	1
228	2	2	729	1	0
246	3	0	733	1	0
250	1	0	734	21	21
479	1	0	740	1	1
503	1	0	750	1	0
530	3	1	754	1	1
531	1	0	755	1	1
534	1	0	768	1	0
539	27	11	775	1	0
549	1	2	777	1	1
551	4	3	780	1	1
552	86	25	782	1	1
555	1	1	784	1	0
609	3	4	789	1	1
615	2	0	908	1	1
626	1	0	930	1	0
639	1	1	931	37	9
642	1	1	932	1	0
643	1	1	933	1	1
644	1	1	935	1	1
652	1	1	979	2	0
662	15	3	988	1	1
663	1	0	991	1	0
665	1	1	998	2	2
667	1	0	1000	1	1
670	18	9	1001	2	3
678	3	1	1004	1	0
679	1	0	1005	3	4
688	1	1	1009	1	1
690	1	0	1010	7	10
692	1	0	1014	1	1
693	1	0	1017	3	3
			1018	1	0
			1019	2	3
			1021	1	1
			1028	1	1
			1031	1	1
			1060	1	0
			1111	1	1
			1116	2	0
			87 Sites	777	269

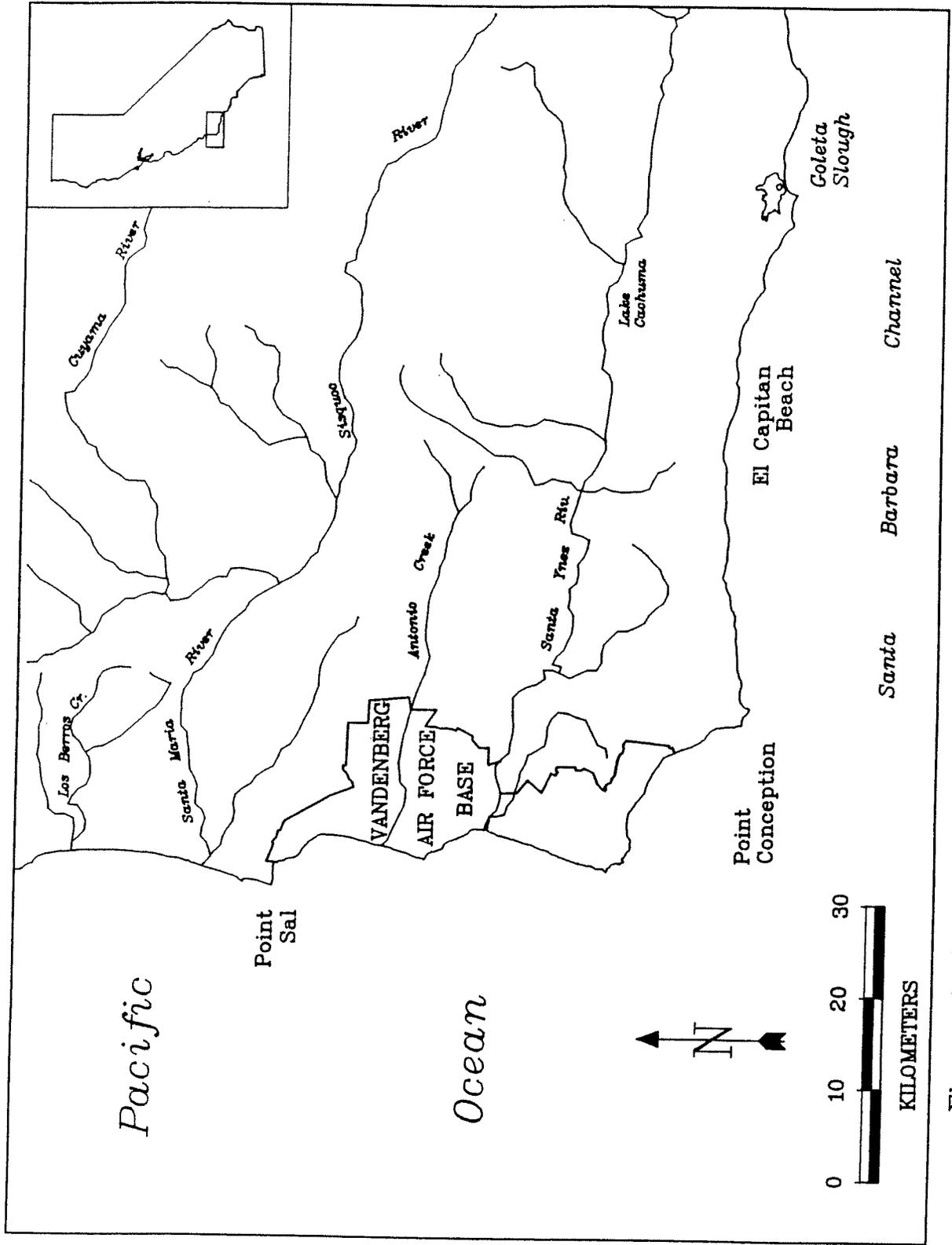


Figure 1: Vandenberg Air Force Base and surrounding region.

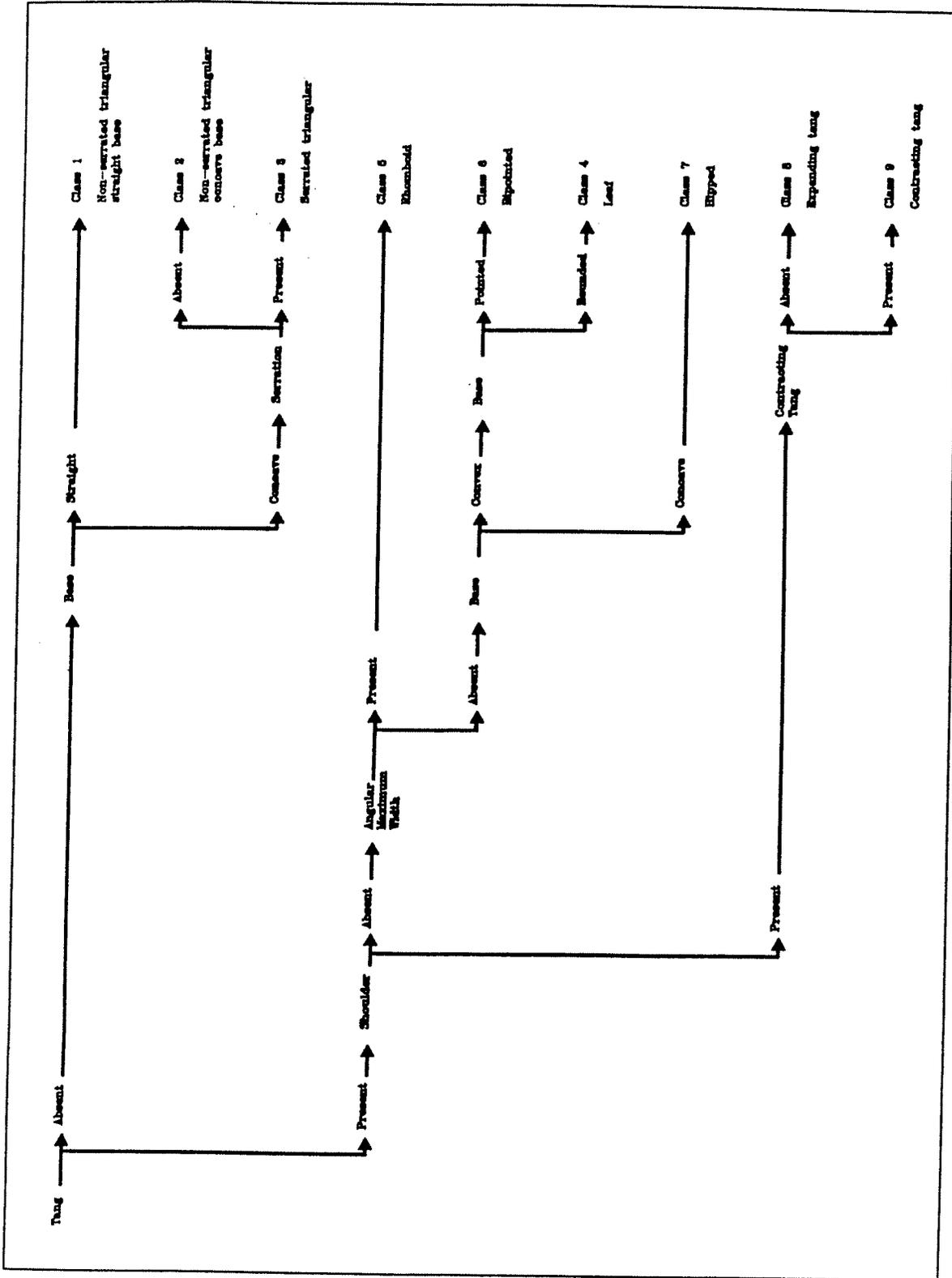


Figure 2: Santa Barbara projectile point key.

Table 2. Attribute list.

<u>Variable</u>	<u>Value</u>
Angular maximum width	Present/Absent
Base shape	Concave Straight Convex Pointed Rounded
Contracting stem	Present/Absent
Distal shoulder angle (DSA)	90-270/Five degree intervals
Length (maximum)	Measured in millimeters
Notch opening index (NOI)	DSA minus PSA
Proximal shoulder angle (PSA)	0-270/Five degree intervals
Serration	Present/Absent
Shoulder	Present/Absent
Tang	Present/Absent
Weight (Index)	Width times length
Width (maximum)	Measured in millimeters
Width/length ratio	Width divided by length
Complete weight	Measured to nearest tenth (.1) gram

Table 3. Specimen count by subtype.

Subtype	Count	Subtype	Count
1B	3	5A	1
1C	4	5B	7
1E	1	5C	6
2B	5	6A	16
2C	1	6B	10
2E	1	6C	12
2G	2	7D	1
2H	2	8A	2
2I	1	8E	1
2J	1	8I	3
3C	1	8J	4
4A	12	8L	1
4B	12	8M	2
4C	9	8N	2
4D	12	8O	1
4E	18	9A	44
		9H	13
		9M	3
		9P	22
		9Q	1
		9S	32
		<u>Total</u>	<u>269</u>

## ESTIMATED LENGTH AND THE WEIGHT INDEX

An estimate of complete length and an index of mass was sought that could expand the diagnostic variables list to include fragmentary specimens. Glenn (n.d.:Table 6) found a high correlation between length and width within Types 4, 5, and 6, between .754 and .808. These point types are morphologically simplistic and therefore less susceptible to variance in mass due to complex reduction strategies.

A simple regression was run on whole specimens of these types, resulting in a 1:2.234 width to length ratio. Estimated length for Type 4, 5, and 6 fragmented specimens was generated from measured width using the derived ratio. With width and estimated length, or in the case of whole specimens measured length, available for all Type 4, 5, and 6 specimens, the two figures were multiplied to produce the weight index. This resulted in a common comparative base of approximate dimensions and mass for these types. The index was correlated with the weights for the 62 complete Type 4, 5, and 6 specimens. The result was a positive correlation of 0.937 (Glenn n.d.:8) thus verifying the validity of estimate.

## TEMPORAL ASSIGNMENT: PRIOR SOUTH COAST TYPOLOGICAL STUDIES

Projectile point (biface) morphology as a temporal indicator has had limited use in the Santa Barbara region. Most regional archaeologists have, in the past, been content to simply describe bifaces with limited reference to temporal or spatial associations. Specimens are placed into gross temporal categories, e.g., Rogers' (1929) Oak Grove, Hunting, or Canalino; King's (1981) Early, Middle, or Late periods, without fully documenting goodness of fit. Generalizations of temporal affinities by no means reflects inadequacies on the part of archaeologists concerned, but instead reflects the limited database at hand. Few large scale excavations capable of supplying the required sample have been carried out since the introduction of radiocarbon dating techniques. One notable exception is Greenwood's (1972) excavations at Diablo Canyon, San Luis Obispo County. A review of major previous local works is germane.

Several earlier works have provided substantive additions to biface typology within the Santa Barbara region (Rogers 1929; Carter 1941; Orr 1968; Hoover 1971). However, these works fell short of one of the foremost goals of archaeological typology, i.e., describing temporally sensitive attributes or modes (Rouse 1939). The works of D. Rogers and Orr comprised specimens from multiple sites. Unfortunately, these works contained only gross descriptions and general temporal discussions.

David Banks Rogers' (1929) seminal work for the Santa Barbara Museum of Natural History provided archaeologists with their first clear look at the Santa Barbara sequence. Rogers supplied limited descriptions of point morphology, but, with the addition of figures, most nuances of biface variation are apparent.

Carter's (1941) work at Point Sal provided a more thorough descriptive foundation for biface morphology. Though limited in its scope, good stratigraphic control and quantitative analysis resulted in an accurate, and still valid, description of the region's point sequence (Carter 1941:222-223).

Orr's (1968) work on Santa Rosa Island is a potentially valuable addition to the understanding of biface variation through time. However, it is limited in that no singular descriptive or tabular summary is provided for the numerous biface types recovered. Such

an undertaking would entail a large expenditure of time, but would unequivocally add to the overall understanding of the sequence, as well as a more complete understanding of island/mainland interaction.

Hoover (1971) constructed a typology for projectile points and knives, as well as other artifact types, from the Santa Barbara Channel region with the goal of initiating a standardized format for artifact classification. Hoover (1971:1-2) recognized the necessity for such a system and has attempted to construct it in a manner that would allow for continuous updating. He made no attempt to place his types within a temporal or spatial framework, but instead concentrated on uniform description of prominent morphological features. There are, however, several major flaws in the execution of his concept.

Hoover's proposed types were presented as artifact descriptions and lacked rigid guidelines for application. In addition, it lacked definitions of descriptive terms and failed to apply terms in a consistent manner. He also failed to heed his own advise concerning updating of the typology (Hoover and Sawyer 1977). Hoover and Sawyer (1977:34-35) presented projectile point descriptions that failed to include reference to small side-notches present on many of their Late period specimens. These points were subsequently classified as Type 4b (thin, triangular, delicate concave-base and swallowtail points, under 4.0 g) along with points of similar morphology and size, but lacking the notching feature. If not for the illustrations provided, this diagnostic feature would not have been evident.

The Diablo Canyon excavations by Greenwood (1972) provided over 800 bifaces classified as projectile points and blades. Many additional bifaces were assigned to knife and chopper categories. The divisions between points, blades, and knives was based almost exclusively on size, whereas the chopper category was separated from knives using attributes related to degree of finish (edge uniformity and angle) and retention of cortex in addition to overall size (Greenwood 1972:21).

Greenwood presents six projectile point types encompassing 15 subtypes; blades were divided into three types with five subtypes distinguished (Greenwood 1972:13-19). All major type divisions focused on morphological variation within the haft element. Subtype divisions were based on more discrete traits of the haft elements as well as relative size and proportions, e.g., weight and width/length ratio. Type and subtype occurrence within the stratigraphy was tabulated for each site with a short discussion of temporal affinity and sequence presented in the chronology section of the monograph (Greenwood 1972:87).

One additional study has recently been completed by Glenn (n.d.) in which bifaces from 55 sites were classified according to morphological similarities and tested for temporal sensitivity (Glenn n.d.). Nine point classes, encompassing 65 subtypes, were recognized. It should be noted that 179 of the 404 bifaces analyzed during Glenn's study were from the Vandenberg collection and therefore familiar to the author.

While Glenn's (n.d.) study can be considered only preliminary, it provides the foundation for a comparative databases that has been sorely needed. Glenn's study has in some instances provided empirical confirmation of previously assumed type sensitive morphology, while in other cases previous temporal assignments have been brought into question (Glenn n.d.:42, Table 8). The plethora of subtypes reduces the applicability of the typology, but as stated (Glenn n.d.:41), some subtype designations have proved useful in distinguishing chronologically sensitive modes. However, the minimal diagnostic temporal unit remains the period, with little useful data concerning phase designations.

Other salient features of Glenn's study are the list of referenced terms and a dichotomous key. The list of terms allows the user to become conversant with the

divisional criteria of the key, while the key allows accurate replication of type assignments with a minimal amount of training. This key will provide the model for this analysis (Figure 2). A modified term list is provided in Appendix A.

The ease with which type assignments can be made using Glenn's (n.d.) key does not carry through to the subtype level. Descriptions were extremely general and divisive criteria somewhat nebulous. Divisional criteria used in the current analysis attempts to more fully describe divisive modes within the parameters of Glenn's (n.d.) summary statistics. Subtype assignment within the more complex types relies heavily on illustrative comparisons and summary statistics. New subtype labels and definitions are added where appropriate.

Type 9 of Glenn's (n.d.) study has been highly modified for this analysis. As stated (Glenn n.d.:39), revisions have resulted in the lumping of many Type 9 subtypes. Divisive criteria for the current analysis are objective and defined for each subtype. Glenn's (n.d.) study recorded five Type 9 subtypes which were postulated to be temporally sensitive. Divisive criteria used in the current study attempted to deduce divisive criteria applied to previous analysis and thereby retain temporally sensitive subtypes. This was in some cases impossible to accomplish. I believe this reflects the subjective divisive criteria applied to the type.

## TYPOLOGICAL CONSIDERATIONS

The typological ordering of artifactual materials recovered by the archaeologist is as old as the discipline itself (cf. Thomsen 1836). Indeed, the systematic placement of entities into cohesive groups is undoubtedly as old as humankind's ability to differentiate them to one another. Therefore, to question whether types can be real is to presume a member of any given cultural group cannot discriminate between objects to their peer. For the archaeologist, however, the question must be viewed in light of contentions presented in the literature.

Numerous early works are devoted to, or address matters of, typology and classification (cf. Rouse 1939; Kreiger 1944; Taylor 1948). However, it is a particular group of articles, reviews, rebuttals, and replies, which have stimulated controversy concerning the "reality of types" more than any other (Ford 1952, 1954a, 1954b, 1954c; Spaulding 1953a, 1953b, 1954a, 1954b; Steward 1954). Both Ford's and Spaulding's arguments have valid points which are necessarily contingent on the definition of "type".

To Ford (1954b:52), artifactual typology was a "tool designed for the reconstruction of culture history in time and space". On the matter of "historical relevance" Spaulding and Ford were in agreement (Ford 1954a; Spaulding 1953a:305) Spaulding (1954b:391) interpreted Ford's objections as inferring that "the use of statistical analysis constitutes denial of continuous variation in time and space". Spaulding argued cogently that the "relevance" that Ford was seeking was to be found in the interpretation resulting from use of Spaulding's statistical techniques and were not their end product.

There are, undoubtedly, as many definitions of "types" as there are authors writing about them. The use of any single definition is an open invitation for argument. For the purpose of this discussion, selection of a definition is an attempt to mediate the disparate interpretations. Hill and Evans (1972:233) coalesced several definitions:

A "type" then, is a group that has been formed on the basis on a consistent patterning of attributes of the materials or events, and it is distinguished from other types, which are different patterns of attributes.

Notably lacking from this definition was the requirement for "historical relevance" of the type; a point which I shall elaborate.

Hill and Evans (1972) notable omission of the term "historical relevance" from their definition was fundamental to their approach to the problem. They viewed typological classification as an analytical tool with which to address specific hypotheses (Hill and Evans 1972:255). These hypotheses did not necessarily address "historical relevance". They pointed to the landmark work by Brew (1946:65) in which he states:

We must classify our material in all ways that will produce for us useful information.... We need more rather than fewer classifications, to meet our needs.

With this philosophy in mind, Hill and Evans (1972:252) proposed the "positivist" model for classification. In doing so, they removed the burden of "historical significance" from the shoulders of typological analyses. Continuing their explanation of this philosophical view, they asserted the "multiplicity of ways" in which materials could be typed. Each type constructed to address specific questions.

As stated by Spaulding (1954a), "the important thing is to be explicit about what kind of type one is talking about". Steward (1954:54) presents four "types of types" in order to extend Ford's clarification of the problem. The current analysis deals with those types designated by Steward (1954:54) as "morphological" and "historical-index" which address "time space occurrences of cultural phenomena".

The responsibility for the "reality" of the distinguished types rests on the analyst's ability to define the problem and record suitable attributes with which to test the hypotheses. If these attributes cluster in non-random distribution, then the analyst has indeed "discovered" types. It is with reference to the selection of attributes that attention must be focused. According to Spaulding (Personal communication in Hill and Evans 1972:261):

Once the selection of variables whose inter-relationship are to be studied is made, the properties of the archaeologist drop out of the picture, and so does the concept "arbitrary". The result of the study is determined by the properties of the collection and the nature of the analytical techniques applied to it. Any number of archaeologists employing the same analytical techniques on the same variables in the same collection should come up with the same results.

The selection of analytical attributes is the most critical element of the analysis. As Hill and Evans (1972:255) expounded, "the attributes one chooses to emphasize in generating types will (and should be) dependent on the precise interests of the investigator". The process by which one obtains relevant attributes for analysis was left nebulous. Hill and Evans (1972:261) pointed out that "not all attributes can conceivably be considered" and that the analyst was "in fact making his attribute selection in terms of at least some vague *a priori* interests" [*italics added*]. However, it is above all necessary to look at the artifacts! It is to often that analyses fail to regard intuitive insight as a useful tool.

It should be stated that much of what is accomplished in the area of typological studies today relies heavily on the numerical taxonomy techniques previously applied in biology (cf Wallon and Brown 1982). These techniques and others are not applicable to the current study and are, therefore, not discussed further.

A search of the literature dealing with projectile point typologies revealed several recurring projectile point forms which could be described by their attribute values and relationships (Lanning 1963; Heizer and Hester 1978; Thomas 1970, 1981; others). Thomas stated repeatedly (1970:31, 35, 40, 44, 46) that the goal of his operational system was to "mimic the original intuitive typology" utilizing objective criteria. The current analysis was likewise conceived and executed in this manner.

## POINT TYPE DESCRIPTIONS

Type and subtype descriptions relate predominantly to the size range and the overall morphological patterns observed in the collection. In addition, attention is given to reduction, finishing, and rejuvenation techniques that appear consistently within the type or subtype. Reference to reduction techniques is necessarily limited to those attributes that are retained through the last stage of reduction, e.g., original flake scars, pressure flaking (Crabtree 1982). Specimens are then compared with previously documented collections and a summary of temporal and spatial distributions is presented. Temporal discussion of the Santa Barbara region and the southern California coast in general is with reference to chronological divisions proposed by King (1981) (Table 4). In most cases, discussion to the subtype level is relevant.

### Type 1: Non-serrated Triangular with Straight Base (Figure 3)

The Type 1 designation encompasses points that are triangular in outline including a straight base, and lack blade serration. Type 1 is represented by eight specimens in the sample. Distribution is restricted to four sites: SBA-210, 214, 552, and 1010 (NOTE: In the California State numbering system, SBA denotes Santa Barbara County). All specimens are made from Monterey chert and range in color from dark brown to light tan. Subtypes 1B and 1C of Glenn's (n.d.) analysis are represented. Subtype 1E is an addition to Glenn's study.

#### SUBTYPE 1B

Three examples of Subtype 1B occur in the sample. Two are from SBA-210, while the third is from SBA-552, located directly adjacent to SBA-210. The single complete specimen is 30 mm long and 14 mm wide with a width/length ratio of 0.47:1. The incomplete specimen from SBA-552 is 20 mm wide and appears to have proportions similar to the complete specimen, except the blades on the partial specimen appear to constrict more rapidly. Complete length would be approximately 40 mm given the more abrupt blade termination.

Size would indicate that this subtype represents arrow points. However, the variable depth at which they were located, 0 to 300 cm, and the dull tip on the only complete specimen does not substantiate this inference. This contradiction can be partially

Table 4: Santa Barbara Channel sequence (King 1981).

Period	AGE (Estimated Dates)	
	(A.D./B.C.)	(Y.B.P.)
L3a	A.D. 1782-1804	146- 168
L2b	A.D. 1650-1782	168- 300
L2a	A.D. 1500-1650	300- 450
L1c	A.D. 1400-1500	450- 550
L1b	A.D. 1250-1400	550- 700
L1a	A.D. 1150-1250	700- 800
M5c	A.D. 1050-1150	800- 900
M5b	A.D. 1000-1050	900- 950
M5a	A.D. 900-1000	950-1050
M4	A.D. 700- 900	1050-1250
M3	A.D. 300- 700	1250-1650
M2b	200 B.C.-A.D. 300	1650-2150
M2a	800- 200 B.C.	2150-2750
M1	1400- 800 B.C.	2750-3350
Ez	2400-1400 B.C.	3350-4350
Eyb	3500-2400 B.C.	4350-5450
Eya	4500-3500 B.C.	5450-6450
Ex	6000-4500 B.C.	6450-7950

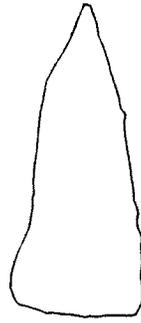
Key

L = Late period  
M = Middle period  
E = Early period

Type 1



1B



1C



1E

Type 2



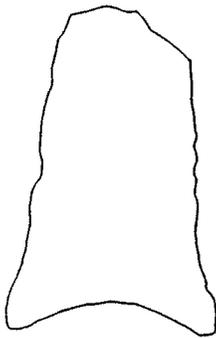
2B



2C



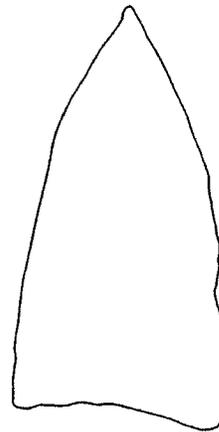
2E



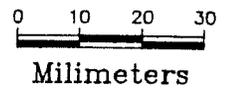
2H



2I



2J



Milimeters

Figure 3. Projectile Point Types 1 and 2 showing examples of subtypes.

explained by more in-depth examination of the individual specimens.

The specimen found in the upper 20 cm of SBA-210 more closely resembles the "classic" Chumash point than the specimen found between 280 and 300 cm. Blade shape on this deepest specimen is convex, or more precisely parallel-ovate, (Binford 1963:200), while the other specimens' blades are straight. This minor variation may be diagnostic. However, sample size precludes anything other than intuitive inference.

Document research has identified several comparable specimens from other local collections. Glenn (n.d.:Table 7a) listed specimens from SBA-53, 60, and 167. Both SBA-60 and SBA-167 were dated, using King's (1981) bead seriation data, exclusively to the Late period. In contrast, SBA-53 was dated by radiocarbon exclusively to the Early period,  $4620 \pm 80$  B.P. (A-0303),  $4890 \pm 80$  B.P. (A-0302),  $4980 \pm 60$  B.P. (A-0363) (Harrison and Harrison 1966:34). This single occurrence at SBA-53 was in all likelihood a Late period isolate and does not reflect the subtype's true temporal distribution. This is further substantiated by the Harrison and Harrison report (1966).

Other occurrences on the South coast were reported from SLO-214 (Hoover and Sawyer 1977:34), SBA-78 (Harrison 1965), and several sites in northern San Diego County (True and Waugh 1981). Further research would undoubtedly lead to the conclusion that this subtype was wide spread during the Late period. Additional comparison can be made with the Cottonwood Series (Lanning 1963; Heizer and Hester 1978). Further discussion of this relationship will be presented during analysis of Subtypes 2B-E, Type 3, and Subtype 4A where correlations are strongest.

A preliminary analysis of beads from SBA-210 and SBA-552 indicated the presence of a Late period component in addition to the earlier periods indicated by the radiocarbon dates. Occurrence of the subtype is placed within the Late period with a fair degree of confidence. Nevertheless, it is probable that the deepest occurring specimen at SBA-210 does, in fact, represent a temporally distinct variety, although vertical movement related to faunalurbation cannot be dismissed.

#### SUBTYPE 1C

Subtype 1C is represented by four specimens: one from SBA-210, one from SBA-214, and two from SBA-1010. All specimens are rather crude showing little, or no evidence of pressure flaking. All are basally thinned and fully capable of being hafted. The SBA-210 specimen shows evidence of edge damage on the proximal one-third of the blade. This may be indicative of use as something other than, or in addition to, a projectile point.

Two specimen were originally classified as other than Type 1 points. One specimen from SBA-1010 shows a slight concavity to its base and, if analyzed exclusively, would probably had been assigned to Type 2. The SBA-214 specimen was originally classified as a Type 7 (Hipped) point due to the area of maximum width not being at the extreme proximal end of the point. Closer examination revealed that this attribute reflected the asymmetry of the point. These observations evince one weakness of attribute based analysis. Overall size range (5.8 to 10.6 gr) would restrict their use as arrow points, but all would function well as dart tips.

Comparable data are lacking for this subtype. Glenn's (n.d.) study documented only the four Vandenberg specimens presently being analyzed. A document search resulted in

no illustrated or described examples being located. It is possible that this subtype is a local, use specific phenomena. However, the document search was not exhaustive and further research may return positive results.

Temporal assignment is currently impossible for this subtype. Nevertheless, some data are available. SBA-1010 has a single associated radiocarbon date of  $2240 \pm 160$  B.P. (UCR-0269), while SBA-210 has, among its many radiocarbon dates, a single analogous date of  $2240 \pm 150$  B.P. (UCR-0254). These would indicate a possible temporal assignment to the second phase of the Middle period (King 1981). Such an assignment is extremely tenuous given the complexity of the two sites involved. Although blanket statements relating to two specimens would be presumptuous, the morphological and dimensional similarities are striking. This could be used to infer that the subtype has relevance beyond that of expedient classification, i.e., time, space, or function.

#### SUBTYPE 1E

Subtype 1E is an addition to Glenn's classification. It is represented by a single occurrence at SBA-1010 and is similar to Subtype 1C in every respect but length. The specimen is 32 mm long, contrary to Subtype 1C's 50, 53 and 64 mm lengths resulting in a width/length ratio of 0.66:1. The point was examined for evidence of rejuvenation, but none was found. The specimen appears to be in its primary state of completion and exhibits a more refined finish than that of Subtype 1C, i.e., a small amount of pressure flaking around the tip.

Little comparable data were found regarding this subtype. A close approximation was illustrated by True and Waugh (1981:Figure 17) at Rincon 16, a San Diego County site. This association would indicate that Subtype 1E is a division of the Cottonwood Series. This does not correlate with the radiocarbon data from SBA-1010, but as stated earlier, SBA-1010 is a complex site with only a single radiocarbon date as a guide. Bead seriation and a suite of radiocarbon dates would undoubtedly elucidate the problem.

#### Type 2: Non-serrated Triangular with Concave Base (Figure 3)

Thirteen Type 2 points were recovered during the project, with the bulk (9) being recovered from the surface. These points all share the common attributes of triangular blade outline, concave base, and no serration. In terms of Binford's (1963) classification scheme, most of the blade outlines would be considered ovate. Since blade shape appears to be on a continuum, this minor degree of variation did not appear diagnostic within this type. As noted earlier (Subtype 1B), such a minor variation may, in some cases, have diagnostic relevance.

This type exhibits a great variation in size which, at least in part, relates to their temporal heterogeneity. Lengths within the type range from 19 to 70 mm. Nevertheless, width/length ratio does not vary significantly. Variation is apparent, but is distributed randomly among the subtypes.

## SUBTYPE 2B

Subtype 2B is represented by five specimens from four sites: SBA-210, 710, 780, and 931. These small, light projectile points are well known both archaeologically and ethnographically as the "classic" Chumash or "swallow-tail" arrow points. Length of Subtype 2B specimens range from 19 to 25 mm with the average being 21.8 mm.

Three of the specimens are made from dark brown Monterey chert, one from green Franciscan chert, and one from gray fused shale. The nearest known fused shale source is located in southern Ventura County. All five specimens display evidence of extremely fine workmanship, with three specimens retaining original flake scars on both surfaces. Two Monterey and the fused shale specimen have well defined basal indentations and better exemplify the name "swallowtail".

Proximity to the surface indicates the most recent phase of deposition at the respective sites. This, along with known Late period association, suggests a Late period occupation at each of the sites represented. Bead data from SBA-210 verifies this assumption with reference to this site. Unfortunately, temporal information concerning SBA-710 and 790 is lacking.

SBA-931 has no known Late period component. Thirteen dates are currently available; 11 of these fall below the earliest dates of the Early period previously documented, i.e., 6450 B.P.. Two dates fit comfortably into King's (1981) second phase of the Middle period. The depth at which the specimen was found, 10 to 20 cm, indicates substantial deposition subsequent to the point's positioning. Further analysis of associated artifacts would clarify the nature of the deposit. Current understanding of the sites composition would indicate the specimen resulted from an isolated or extremely short term event.

King (1978:Figure 8) mapped the known distribution of this subtype within the California culture area during protohistoric times. Point distribution covered virtually the entire southern California area. The ubiquitous occurrence of this type during this time is widely documented. Nearly every report relating to protohistoric occupation contains reference to this subtype. The spread of this subtype is strongly associated with the proposed Numic language spread (Moratto 1984:569).

Heizer and Hester (1978:11) referred to this point subtype as the Cottonwood Triangular type with reference to Lanning (1963) who had first proposed it. Lanning (1963) developed the type as a result of excavations at the Rose Spring Site. Heizer and Hester (1978) stated that the type, and indeed the series, had wide distribution in the Great Basin during the late prehistoric and historic times. The Cottonwood Series includes the triangular point described here, a leaf shape, and a bipoint. The two latter points represent Type 4 (Subtypes A and B), and Subtype 6A respectively. Further research has noted that the occurrence of Cottonwood Triangular points predate the Cottonwood Leaf variety by several centuries. Discussion of this dichotomy will be addressed during the Subtype 6A description.

Associations with Desert Side-notch points in the Great Basin are also common. Such associations have been documented in San Luis Obispo, Kern, and San Diego Counties (Hoover and Sawyer 1977:34; Wedel 1941; King 1978:Figure 8). No Desert Side-notch points were recovered during the project and few are known from within the Santa Barbara Channel. This association is also lacking at the Diablo Canyon sites (Greenwood 1972).

#### SUBTYPE 2C

Subtype 2C has only a single occurrence in the collection. This specimen was recovered from SBA-210 between 20 and 40 cm below the surface. It differs from Subtype 2B in two respects: blades do not immediately begin to constrict and the specimen is notably thicker. The specimen is made of variegated obsidian, which appears to be extremely workable. The overall thickness of the point (7 mm thick and 13 mm wide) would make hafting extremely difficult. The specimen does, however, appear to have been broken in use given the lateral bending fracture. The exotic material may be a clue to its aberrant morphology.

Temporal associations are restricted to radiocarbon dates derived from the site of origin (SBA-210). Association with the previous subtype, both morphologically and spatially, would infer a Cottonwood Triangular model. This would, in turn, indicate a late prehistoric or historic origin. Such an inference would necessarily need to be substantiated with further examples. Research failed to disclose any comparable specimens, but reference to an anomalous "fat" point might well escape documentation.

#### SUBTYPE 2E

One example on Subtype 2E was recovered during excavation of SBA-552. This subtype is comparable in many respects with Subtype 2C with the exception of thickness. The subtype may indeed be considered to be a transitional specimen between Subtypes 2B and 2C. The material is Monterey chert of a fair quality. Workmanship reflects this less than ideal stone quality.

Temporal associations are generally lacking for the upper levels of the SBA-552 deposit. cursory examination of beads indicates a Late period component. A more exact temporal association should be revealed upon completion of the bead analysis. The large size relative to other Cottonwood specimens and the somewhat crude execution could be an indication of a developmental stage of the type.

#### SUBTYPE 2G

Subtype 2G is represented by two specimens in the Vandenberg sample. This subtype is differentiated from other Type 2 forms by its size and width-length ratio which averages 0.6:1. Both specimens were made from Monterey Chert. One specimen each was recovered from the surface of SBA-1000 and SBA-1031. No temporal assignment for the subtype can be postulated from the Vandenberg evidence alone. No radiocarbon dates nor seriation of diagnostic artifacts has been produced. No other points were recovered from these two sites.

Analysis of size places the specimens between the small Cottonwood Triangular Types, e.g., Subtype 2A, and the Encinitas Series, e.g., Subtype 2H. These two series represent the youngest and oldest projectile point forms in the Vandenberg collection, respectively.

Glenn (n.d.:Table 7b) indicated one Subtype 2G specimen from SBA-167. Glenn's analysis of beads from the site suggested a single component assigned to the Late period. This would suggest that Subtype 2G is a member of the Cottonwood Series which was well represented at SBA-167. Further evidence is seen through comparison of the Vandenberg

specimens with those recovered from SDI-73 and other sites along Frey Creek in San Diego County (True and Waugh 1981). These sites were postulated by True and Waugh to be from the San Luis Rey Complex, a Late complex representing the predecessors of the Luiseno, circa A.D. 1400 to A.D. 1750 and (Meighan 1954). Additional references include Greenwood (1972), Lanning (1963), and Thomas (1982), all of which assign analogous specimens to the Cottonwood Series.

#### SUBTYPE 2H

Two examples of Subtype 2H were recovered: one from SBA-552 (120-140 cm) and the other from the surface of SBA-933. Both are made from Monterey chert. The SBA-552 specimen is a dark brown, excellent quality material with residual tabular cortex on one face. The SBA-933 specimen is a mottled color reflecting the heterogeneous nature of the stone.

Neither specimen is complete, but complete length can be accurately estimated at between 75 and 80 mm. Maximum width is 35 mm on one example with the other specimen estimated to have a similar dimension. Rate of blade constriction is greatest just distal of the base, after which constriction is at an even and less dramatic rate. The SBA-933 specimen exhibits a slight curvature to the vertical axis.

No comparable specimens have been located in local collections, and no reference can be found to its occurrence in adjacent areas. Data concerning temporal assignment are, therefore, restricted to a single radiocarbon date from the level below the SBA-552 specimen, i.e., 140 to 160 cm. A date of  $3630 \pm 200$  B.P. (UCR-260) was obtained from a charcoal sample. This associated date indicates a temporal assignment within the last phase of the Early period, ca. 3350 - 4350 B.P. Assignments of this nature are tenuous and further associative analysis is warranted.

Morphological similarities between Subtype 2H and Subtype 2J justify comparison. The single dissimilarity is in the blade shape. Subtype 2H has a concave blade, whereas Subtype 2J has a convex blade. This difference may be characteristic of blade rejuvenation. This is further evinced by the beveled appearance of the SBA-933 specimens. Beveling is associated with unifacial retouch of the blade. Further discussion of regional correlations is presented under Subtype 2J below.

#### SUBTYPE 2I

The single specimen representing Subtype 2I was recovered from SBA-1010. It is made from high quality gray/green obsidian with faint flow lines visible. The specimen measures 70 x 23 mm and weighs 11 g. The blades are parallel-ovate with the greatest constriction occurring just proximal of the tip. A slight indentation, approximately 2 cm from the base, mostly likely reflects modification to assist in hafting. The extremely deep basal indentation is likewise suited to this purpose. Extremely fine transverse parallel pressure flaking is noteworthy.

Tentative temporal assignment of SBA-1010 to the second phase of the Middle period, (2150-2750 B.P.), has already been discussed. Additional temporal data for this subtype are limited to material from outside the immediate area, i.e., the western Great Basin, the Sierra Nevada, and the California desert.

Two type descriptions are applicable: the Humbolt Basal-notched and the Sierra Concave Base (Heizer and Hester 1978:2-3, Figure 1e; Moratto 1984:316, Figure 7.11.E). Heizer and Hester (1978) listed four radiocarbon dates applicable to Humbolt Basal-notched points. These ranged from 4310 to 5300 B.P., all of which pre-date the inferred age of SBA-1010.

Occurrences of the Humbolt Series in California is restricted to the Sierra Nevada Range, with some spill-over into the Central Valley and the desert region. The Humbolt Series is placed within the Spooner phase in the Northern Sierra dating between 4000 and 7000 B.P. Moratto (1984:302) postulated that these sites relate to early to mid-Holocene occupation by Great Basin people.

Temporal assignment of Humbolt Basal-notched points in the desert region is more problematic. Points comparable to this type were excavated at Ray Cave. However, there is some difficulty in interpreting the stratigraphic placement of the type and no illustrations were available for comparison. All subsequent references describe occurrence of "Humbolt Series" or "Humbolt Concave Base" points. The Humbolt Basal-notched variety is notably absent.

Sierra Concave Base points are predominantly found in the central and southern Sierra regions. Temporal assignments relate to the Chowchilla phase, ca. 2250 - 1650 B.P. in the central Sierras (Moratto 1984:316, Table 7.2, Figure 7.11.E) The southern Sierras are represented in the Canebrake phase, ca. 3150 - 1350 B.P. These dates are contemporary with that of SBA-1010. Obsidian source data for the specimen would aid in determining which region's chronology to use.

#### SUBTYPE 2J

A single representative of Subtype 2J is in the collection under analysis. Subtype 2J is described as large, wide triangular points with convex (ovate) blades and a concave base. Because this is the only specimen fully recorded for this subtype, no range of dimensions are possible. This particular specimen is 68 mm long and 35 mm wide resulting in a width/length ratio of 0.51:1. The specimen was recovered from SBA-1010 and is made from Monterey chert. Primary flake scars are principally conchoidal with secondary scars being discontinuous. Small islands of remnant mass remain on both faces; these contain residual tabular cortex.

No local manifestations of this subtype are evident given the research conducted. Research outside the local area has revealed a great deal of documentation. It is apparent from this literature review that this subtype represents an early manifestation in California prehistory.

One southern California coastal reference to an analogous point has been located. This is the Tank Site (LAN-1) described by Treganza and Malamud (1950) and Treganza and Bierman (1958). The site, located in Topanga Canyon, Santa Monica Mountains, Los Angeles County, has two components with the earliest (Phase I) containing two points analogous to Subtype 2J (Treganza and Malamud 1950:Plate 21i,j). These two points measure 65 and 66 mm, respectively. The description of these specimens (Treganza and Malamud 1950:139) could serve as the subtype description for this analysis. Both are of dark brown chert, extremely thin in cross section and chipped in a "rough" but skilled manner. Johnson (1966; Moratto 1984:127) dates this component to "earlier than 3000 B.C." (5950 B.P.).

Moratto (1984:127-130) list several sites as belonging to a similar cultural complex: Zuma Creek, Little Sycamore, and Glen Annie. Each of these reports was surveyed for comparable specimens with negative results (Peck 1955, Wallace 1954, Owen et al. 1964). All share many traits regarding their artifact assemblages, but the occurrence of Subtype 2J specimens is exclusive to the Tank site (LAN-1). Two specimens have been identified in collections from Rincon (SBA-1) and San Nicholas Island. The Rincon site is known, through preliminary examination of the UCLA collection, to be multicomponent and therefore of little assistance in determining the age of the Subtype 2J specimen. The San Nicholas Island specimen was recovered during surface collections and therefore has no temporal expression.

Further research outside the south California coastal region has led to references considering the Borax Lake site in Lake County, California and the Sacramento Valley region (Harrington 1948; Heizer 1949, respectively). Both of these sites contain projectile point types similar in morphology to the specimen under study and coeval to, or earlier than, the Tank site of Topanga Canyon.

Two comparable specimens were found by Harrington during two separate field seasons. The example found during Harrington's 1945 excavation at Borax Lake is similar in many respects to the specimen from SBA-1010. Dissimilarities include the Borax Lake point (18-F-2469) being over 2 cm shorter than the SBA-1010 specimen and the Borax Lake specimen has been formed from a flake blank. The other specimen from the site (18-F-1594) resembles the previously described Borax Lake point with the addition of an attempted fluting scar. The former Borax Lake point contains several long basal pressure flakes, but no evidence of fluting.

Dating for this site is problematic. Nonetheless, Fredrickson (1973:28; Moratto 1984:83-84) recognizes three cultural components: a Clovis variant (ca. 12,000-11,000 B.P.), a Borax Lake Pattern (ca. 8000-6000 B.P.), and a third component related to the "Middle Central California Complex" (ca. 5000-3000 B.P.). Fredrickson (personal communication 1991) assigns specimens comparable to the two Vandenberg specimens to the Mendicino Aspect of the late Borax Lake Pattern, circa 5000-2500 B.P. (Fredrickson 1984:522).

Sacramento Valley temporal relationships are more explicit than those of Borax Lake. Heizer (1949) dates the Early Horizon in this region to 4500 B.P. This date more closely relates to the date associated with the Humbolt Series described for Subtype 2I recovered from SBA-1010.

Two points similar to the SBA-1010 specimen are illustrated. Both are from site C.68, the Blossom site. Though not stated, it is inferred that this morphological type was assigned to Strong's (1935) Type NAb3. Heizer stated that points not fitting Strong's typology were "arbitrarily" assigned. It is interesting that Strong's Type NBb more accurately describes the form in question. This does, however, reflect subjective criteria. Heizer (1949) recorded 10 Type NAb3 points occurring at four sites: C.68, C.107, C.56, and C.142. Point weight ranges from 6.5 to 31.5 g with an average weight of 18.6 g. The SBA-1010 specimen weighs 14.9 g.

### Type 3: Serrated Triangular with Concave Base (Figure 4)

#### SUBTYPE 3C

A single specimen from the Vandenberg collection qualifies as a Type 3 point. It is recorded as a Subtype 3C due to its slightly larger size and straight blades. The point is made from a very fine grained tabular silicate unfamiliar to the author and was recovered from SBA-1111 (the boathouse). The specimen's tip has been broken from an apparent impact. The fracture notwithstanding, complete length can be estimated at approximately 35 mm. It is in all ways comparable with Subtype 2D with the exception of the extremely fine serration and is also considered a part of the Cottonwood Series discussed in reference to Subtype 2B.

Close examination verifies that this serration is an added feature and is in no way associated with the overall shaping of the point. Eighteen fine flakes were counted along the 3 cm of blade which remains intact. An approximately equal number are present on the opposite blade. These occur both on and between flake scars associated with reduction. Each row of serration flakes was removed to a single face, but it is apparent that the point was flipped to the opposite face prior to serrating the second blade edge. Wedel (1941:63) makes special note of the fine serration present on triangular, concave base arrow points from his Late period sites at Buena Vista Lake in the San Joaquin Valley.

Glenn's (n.d.) study focuses on blade morphology as a divisive criteria for subdivisions within Type 3. These subdivisions do not reflect functional, temporal, or spatial variation to any obvious extent in the sample. Therefore, for this discussion, all subtypes within Type 3 will be considered analogous and will be used in discussion of temporal distribution.

Four Type 3 points were recorded in Glenn's (n.d.) study. Three were from sites not associated with the Vandenberg project: SBA-60, 167, and 585. These three sites have been dated by means of bead seriation; SBA-1111, the source of the Vandenberg specimen, currently has no associated dates. SBA-60 and 167 are both dated exclusively to the Late period; SBA-585 has a known Late period component. In addition, all three sites have a myriad of Cottonwood Series points, i.e., Subtypes 2A-D, 4A, 6A. Data therefore reflects similar temporal and spatial distribution, that is, the Late period. For a more in-depth discussion refer to temporal and spatial discussions for Subtype 2B.

### Type 4: Leaf-shaped (Figure 4)

Type 4 points (bifaces) are those with rounded bases and straight or convex (ovate) blades. The parenthetical use of the term biface is in reference to the inability of some of this type's specimens to serve for any manner of projectile point or thrusting weapon. Many of the larger examples could have only served as choppers or rudimentary knives. Sixty-three example have been classified as Type 4. Fifty-seven of these are made from Monterey chert, five from Franciscan chert, and one from obsidian.

Subdivisions within the type are based exclusively on the weight index. Four subtypes were proposed in Glenn's study (n.d.:12). Mode divisions resulted from exploratory data evaluation using bar graphs. The current analysis adds a fifth subtype to encompass large forms not included in Glenn's study.

Type 3



3C

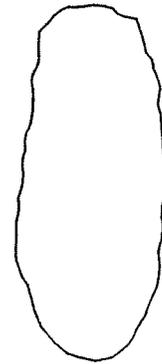
Type 4



4A



4B



4C

Type 5



5A



5B

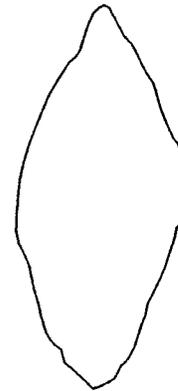
Type 6



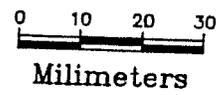
6A



6B



6C



Milimeters

Figure 4. Projectile Point Types 3, 4, and 5 showing examples of subtypes.

#### SUBTYPE 4A

Type 4A represents leaf-shaped points with a weight index of less than 600. This encompasses 12 specimens: eight made from Monterey chert, and four from Franciscan chert. Six sites are represented: SBA-210, 228, 551, 935, 998, and 1009. Only SBA-210 had multiple specimens recovered.

Four of the seven points recovered from SBA-210 were located within the upper 60 cm of the deposit. The three remaining points were found at levels deeper than would be anticipated given temporal data: 120 - 140, 220 - 240, and 280 - 300 cm. This may be due in part to bioturbation; a constant cause of confusion in this area. All other sites were represented by surface finds only with the exception of SBA-551. The specimen at SBA-551 was recovered from between 20 and 40 cm below the surface. Temporal data are available for SBA-210 and 551.

Bead data from SBA-210 indicate a Late (protohistoric and historic) period component. The depth to which this component extends is not clear. A radiocarbon date from Unit 8, 180 - 200 cm was recorded at  $2240 \pm 150$  B.P. (UCR-254). Since this sample was taken from a depth less than those associated with two of the specimens, one might presume an antiquity for the artifacts in excess of this date. However, it is clear that the majority of the specimens are associated with the protohistoric component of the site.

SBA-551 is represented by two radiocarbon dates; both are from Unit 5, 80 - 100 cm. The two dates do not correlate:  $2200 \pm 150$  B.P., and  $690 \pm 150$  B.P.. Until this discrepancy is resolved, temporal placement is not feasible.

Glenn's study (n.d.:Table 7d) records 39 points from 14 sites; five of these were Vandenberg sites. Of the nine remaining sites, seven were dated using bead seriation, SBA-60, 84, 167, 380, 485, 574, 585; one using radiocarbon dating, SBA-53; and one remains undated SBA-54. Data gained through bead seriation inferred a Late period occupation for all seven sites dated by this method. In addition, SBA-585 showed evidence of Middle and Early components as well. Data from SBA-84 were only superficially examined a may contain evidence of additional temporal relevance.

The radiocarbon dates recorded for SBA-53 reflect a single Early period component represented. This has been substantiated by past analysis (Rogers 1929:142-147, Harrison and Harrison 1966). The occurrence of a single Subtype 4A specimen at this site is likely a result of an isolated incident during a later time. Several Late period villages have been documented in close proximity to SBA-53.

Greenwood's (1972:16) Type 2a points appear to be analogous to Subtype 4A currently under discussion; Subtype 6A is also included in Greenwood's Type 2a. She reports 20 specimens recovered at Site 1 and states that the type "tends to occur in the upper levels" (1972:16). Three radiocarbon dates are associated with the site: two from the lower levels (290 and 320 cm) and one from the upper component (120 cm). The upper component was dated at  $930 \pm 50$  B.P. (UCLA-1686B). Site 8 descriptions include reference to five points fairly evenly distributed throughout the deposit (Greenwood 1972:Table 37). A single historic bead recovered between 20 and 30 cm would infer that the late historic occupancy continued at least into the protohistoric phase.

Hoover and Sawyer (1977:34) document a single small leaf-shape point (Hoover's 1971 Type 2b). Hoover assigns all points recovered to the late prehistoric, but emphasizes abandonment prior to the establishment of the San Luis Obispo Mission.

Carter's (1941) work at Point Sal recovered five points from the surface. Four of these were "oval-based" arrow points. Carter assigns these arrow points to Rogers' Canalino period. No mention is made of a possible date or the occurrence of historic artifacts at the site.

Glenn's study (n.d.) and that of R. Greenwood (1972) have examined minor variation of size and morphology in order to ascertain temporal and/or spatial sensitivity of divisive attributes. In doing so, both have come to the conclusion that minor size variation within the group commonly termed "Leaf shaped" is not temporally or spatially sensitive (Glenn n.d.:36, Greenwood 1972:16). With this in mind, temporal and spatial distribution of Subtypes 4A, 4B, and 6A, outside the Chumash sphere, will be considered together.

This group has been previously described as Cottonwood Leaf and Bipoint Types (Lanning 1963, Heizer and Clewlow 1968). Heizer and Hester (1978:11-12) discuss the Cottonwood Series as a whole and treat the types as coeval occurrences. Research into the temporal and spatial distribution of the types precludes such an assumption. Further discussion of the Cottonwood Leaf and Bipoint will follow description of Subtype 6A.

#### SUBTYPE 4B

Subtype 4B represents leaf-shaped points with a weight index of more than 600, but less than 1000. Width ranges between 17 and 23 mm. Length ranges between 38 and 57 mm with a medium of 42 mm. Twelve Subtype 4B points were recovered during the project, all made from Monterey chert. Two of the 12 points were isolated finds, eight were found at SBA-210, and one each from SBA-734 and 1021.

The SBA-210 specimens were widely distributed vertically, though the majority (5) were in the upper 80 cm of the deposit. The deepest specimen was from 340 cm below the surface. The wide range of vertical distribution precludes temporal assignment impossible at SBA-210. Although the majority of the specimens occur in the upper levels, it would be delinquent to ignore associations with earlier radiocarbon dates.

SBA-734 has three associated radiocarbon dates:  $530 \pm 90$ ,  $590 \pm 100$ , and  $3935 \pm 110$ ; lab numbers and depth information were unavailable for these dates. The specimen was recovered from the surface and therefore likely to be associated with the more recent dates. No temporal information is available for SBA-1021.

Comparable specimens excavated by Greenwood (1972) come from sites 1 and 8. Twenty-five chert specimens from Site 1 reflect previously identified distribution patterns, i.e., predominantly upper level. It is noteworthy that none of these larger specimens occurred within the first 10 cm, as opposed to three of the smaller variety. Site 8 yielded three Subtype 4B points (Greenwood's Type 2b): two from between 10 and 20 cm and one from between 90 and 100 cm. All were made from chert. Temporal information concerning these sites is discussed during Subtype 4A description.

Elsewhere in the Santa Barbara region, this subtype is analyzed along with the smaller variety of Leaf shaped points. Therefore, information concerning their distribution is addressed during Subtype 4A discussions.

#### SUBTYPE 4C

Subtype 4C is distinguished from those previously described by its weight index: between 1000 and 1600. Nine examples are present in the Vandenberg collection. Monterey chert is dominant with Franciscan chert and obsidian each being represented by a single specimen. Length ranges between 51 and 71 mm; width ranges between 25 and 31 mm with one anomalous specimen 15 mm wide.

Distribution of this subtype is spread over six sites. As with many subtypes, SBA-210 contained the most specimens (4). The exaggerated representation of site SBA-210 results from a combination of sample size and site density. SBA-931, 209, 552, 609, and 1010 each contained a single specimen.

Site distribution and vertical distribution within sites indicates that this size leaf-shape point has a long life history. SBA-931 has a firmly established Early period represented, as does SBA-209. One specimen at SBA-210 is bracketed by dates of  $3530 \pm 200$  B.P. and  $4650 \pm 230$  B.P. (UCR-299 and 256 respectively), placing it in the final phase of the Early period. The 2240 B.P. date for SBA-1010 relates to the second phase of the Middle period. Finally, surface finds at SBA-210 and 552 infer association with the protohistoric components of these sites.

Glenn (n.d.:34) infers a Late period assignment for the subtype. Five dated sites were represented in the sample. All of these had Late period components with three being dated exclusively to this period.

Greenwood (1972) uses the term blade to describe bifaces with lengths in excess of approximately 55 mm. A certain amount of overlap occurs, however, Greenwood uses additional variables, i.e., edge finish and relative thickness, for divisive criteria. Similar to the Vandenberg sample, Greenwood plots the occurrence of these "blades" throughout the deposits examined with the exception of the lower levels of Site 1.

Subtype 4C-E descriptions are lacking in the literature, in part, because large Type 4 bifaces lack temporal sensitivity. Most references simply refer to this general form, i.e., large and ovate or bipointed (Subtypes 4C-E, 5B-C, 6B-C), as blades or knives. For this reason, temporal description not relevant to the Santa Barbara region will be addressed as a unit comprising Subtypes 4C-E, 5B-C, and 6B-C, and will be placed following local temporal descriptions for Subtype 6C.

Some regularity in morphological patterning has been described locally. Carter (1941:222) notes that "Olson [1930] found no recognizable shifts in blades types", whereas "Rogers [1929] found only crude blades in his Oak Grove, ... oval based spears in his Hunting period, with oval based, leaf-shaped blades ... appearing in the Canalino or late phase." Carter's work at Point Sal "follows Rogers' pattern."

Degree of finish and the application of pressure flaking does tend to be more highly refined in the Middle and Late periods. Criteria for such divisions would be subjective due to the continuum of values. These patterns may indeed reflect temporal relevance. Moreover, factors such as expedience, phase of production and knapping skill complicate the issue.

#### SUBTYPE 4D

Divisional criteria for Subtype 4D require a weight index between 1600 and 2500. Length ranges between 58 and 71 mm. The Vandenberg sample contains 12 Subtype 4D specimens; all are made from Monterey chert. As a whole, less edge refinement is exhibited in large specimens. This may be used to infer an earlier stage in the reduction sequence. This is not to say that highly refined specimens are completely lacking, only that the majority exhibit less refinement common in smaller bifaces.

The longevity of the subtype mirrors that of the previously described subtype (4C). Therefore, distribution discussion is limited to the sample at hand, Glenn's (n.d.) study, and that derived from Greenwood's (1972) excavations at Diablo Canyon. Sites represented in the Vandenberg collection include SBA-210, 539, 552, 644, 670, 725, 931, and 1017. Of these eight sites, SBA-210 and 931 have multiple examples (2 and 3 respectively). One isolated occurrence was also recorded.

Temporal data are available for four of these sites: SBA-210, 552, 670, and 931. All four of these sites have been classified as multi-component: SBA-210 and 552 have components assigned to the Early, Middle and Late periods. SBA-931 is represented by Early and Middle period radiocarbon dates. SBA-670 has dates in the Middle and Late periods represented.

Glenn's (n.d.) sample was represented by four specimens. All were from Vandenberg sites. Analysis of this small sample inferred a Early period placement for the subtype. He cautions that the Late period component at SBA-552 should not be ignored (Glenn n.d.:34).

The Vandenberg Subtype 4D sample cross-cuts Greenwood's (1972) blade and knife categories. This is due, in part, to the lack of extensive edge examination in the present sample. Greenwood's knife category contains two types: bifacial and flake. Materials within her Type 1 (bifacial) designation are predominantly cryptocrystalline silicates, but does include quartzite and siltstone. Vertical distribution of knives reflects that of blades, that is, they are found throughout the matrix with a slightly higher inventory in the upper levels of the deposits (Greenwood 1972:Tables 7 and 38).

#### SUBTYPE 4E

Subtype 4E is an addition to Glenn's (n.d.) classification scheme. Glenn's classification focused on those bifaces that could be utilized as projectiles and, therefore, did not include the large specimens currently being analyzed. Criterion for inclusion in this subtype required a weight index of greater than 2500.

Eighteen specimens in the sample met this criterion. All the examples are made from Monterey chert. This undoubtedly reflects the ease of access to this material source. Length of these specimens ranges from 80 to 114 mm; width ranges between 35 and 52 mm. Specimens were obtained from 13 sites: SBA-208, 210, 549, 552, 644, 662, 717, 755, 777, 789, 931, 988, and 1017. SBA-210 and 552 are represented by multiple examples (4 and 2 respectively). All other site have a single example. Two isolates were also recovered.

Temporal distribution, as inferred by current site assignments, would indicate Early, Middle, and Late periods are all represented. Excavations data list various depths of recovery. These combined data tend to verify the longevity of this form.

Greenwood's artifact descriptions do not entail sub-division of the knife category. Therefore, discussion related to spatial and temporal distribution of this subtype at the Diablo Canyon sites is equivalent to the Subtype 4D descriptions of this analysis.

### Type 5: Rhomboid (Figure 4)

The distinguishing characteristic of Type 5 bifaces is their, more or less, diamond shape (Greenwood's 1972:16 Lozenge, Type 3) though many have a slightly asymmetric outline. The asymmetry is realized by one blade being more smoothly arched than the other. It is unclear whether this is function of use-specific design or simply a product of reduction. Edgework analysis may clarify interpretation. Subtype divisions are based exclusively on the weight index. It is of interest that all 14 Type 5 specimens are in complete condition; an anomaly not reflected by any other type.

#### SUBTYPE 5A

Subtype 5A is represented by a single, asymmetric specimen recovered from SBA-210. It is made from Monterey chert and was excavated from between 320 and 340 cm. Radiocarbon dates for this depth are in excess of 3500 B.P. This would raise doubt as to the legitimacy of a small size/Late period correlation within all morphological groups.

Glenn's (n.d.:13) study contained four Type 5A specimens: two of Monterey chert, one Franciscan chert, and one unidentified chert exhibiting cobble cortex. The sample represented four sites, all of which are known to have a Late period component: SBA-84, 167, 210, and 485. Two of these sites were posited to be exclusively of Late period origin. However, additional evidence from SBA-485 indicates an Early period component as well (Macko 1983). Bead seriation of SBA-167 does support the Late period assignment for this site. Glenn (n.d.) infers a Late period assignment for this subtype.

Greenwood (1972:16) reports 10 "Lozenge" (type 3) points from her Site 1. All 10 are made from undifferentiated chert and occur above 130 cm in the deposit. Graphic depiction of site deposits (Greenwood:Figure 2) permits assignment of these specimens to the Chumash period. (Greenwood uses a combination of designated cultural labels, with "Chumash" representing the most recent cultural period.)

The site of *Mikiw* (SBA-78) contained several comparable specimens. Harrison (1965:112) describes one variety of his Type III as "convex base [with] ... triangular blades with straight sides (Harrison 1965:Figure 15a). A suite of dates clearly indicate the multi-component nature of the site. Three dates range from 180 to 250 B.P. (protohistoric), while a second set range from 3700 to 6830 B.P. (King's late and middle Early period) (King 1981).

Harrison's states that he reports only those artifacts associated with the Late period occupation (Harrison 1965:100). Nevertheless, cursory examination of his data reveal artifact types clearly associated with Early period occupation, i.e., square clam beads and large side-notched points. It is, therefore, impossible to assign this point type to one cultural period without a complete reanalysis of the collection and notes.

Outside the immediate area, references become scarce and often vague. It is clear that the subtype and its larger variation have a long life history. M. Rogers (1939:Plate 9g)

illustrates an example morphologically and dimensionally identical to the Vandenberg specimen. He assigns this specimen to the San Dieguito-Playa Complex under the heading "slender blades". In a graphic summary of the temporal distribution of this complex, Rogers proposes a terminal date for the Playa II phase at about 2700 B.P. (M. Rogers 1939:Plate 21).

#### SUBTYPE 5B

Seven specimens have been assigned to the Subtype 5B: five Monterey chert, one unidentified chert, and one obsidian. Inclusion in the subtype was confined to those Type 5 specimens with a weight index between 700 and 1300. Length of this subtype ranges from 39 to 59 mm; width ranges between 21 and 25 mm. The bulk of the specimens (5) are derived from excavations at SBA-210. SBA-539 and 552 are each represented by a single specimen.

Stratigraphic associations indicate two occupational periods represented by this subtype's occurrence. Vertical distribution at SBA-210 is in two divisions: surface finds and those found between 100 to 180 cm. The obsidian example was a surface find at this site. The SBA-539 specimen was recovered between 30 and 40 cm below the surface. The SBA-552 specimen was a surface find.

All three sites have radiocarbon dates associated with them. A suite of closely correlated dates from SBA-539 indicated site occupation in the early phases of the Middle period ( $2920 \pm 70$  B.P. C-13 adj. Beta-16020,  $2510 \pm 70$  B.P. C-13 adj. Beta-16021). A radiocarbon date of  $2240 \pm 150$  B.P. (UCR-254) at SBA-210 correlates well with the Stratigraphic placement of two Subtype 5B specimens and the SBA-539 dates. Surface finds at SBA-210 and 552 would infer association with the terminal, protohistoric occupation of the sites.

Glenn (n.d.:14, 35) discusses eight Subtype 5B points located at three sites; two of the sites were Vandenberg locales. The third site is SBA-585. The site was dated by use of bead seriation techniques. All three currently recognized periods of occupation were represented (King 1981). Temporal assignment for the subtype was not postulated.

Greenwood (1972) does not include any type of blades or knives with a comparable "diamond" or "lozenge" shape, nor does she elude to any equivalent variant within her described types. Dimensionally, the subtype falls into a void in the Diablo Canyon data set. Maximum length for Greenwood's Lozenge points is 38 mm, whereas the minimum length for her blade categories is 60 mm.

#### SUBTYPE 5C

Criteria for inclusion into Subtype 5C are type 5 points with weight index greater than 1300; six specimens in the Vandenberg collection are encompassed. The length of these specimens ranges from 51 to 85 mm; width ranges from 27 to 39 mm. Material is Monterey chert with the exception of one Temblor Range chert specimen. Four of the six specimens were recovered from SBA-210. One specimen is from SBA-639, and one specimen was recovered from an isolated context.

Three of the SBA-210 specimens were excavated from depths below 140 cm; a fourth specimen was a surface find. This would indicate a date approximately equal to, or older

than the 2240 B.P. date estimated for the 180 to 200 cm level. No temporal data are available for SBA-639 or the isolate.

Glenn's study of subtype 5C dealt with no sites outside the of Vandenberg collection. No temporal inferences were postulated given the multiple component aspect of SBA-210 and the lack of temporal data from SBA-639 (Glenn n.d.:35).

As stated during Subtype 5B discussions, Greenwood's (1972) Diablo Canyon data set does not include reference to a "diamond" or "lozenge" shape. It does, however, address blades of comparable size. Greenwood terms these blade shapes "Leaf", "Side-notched", and "Weakly shouldered with contracting stem". Discussion of the "Leaf" shaped types, the closest approximation to Type 5 morphology, is discussed in reference to Subtype 4C of the current analysis.

### Type 6: Bipointed (Figure 4)

Type 6 points are distinguished by their arched (excurvate) blade and pointed base. Thirty-eight points in the Vandenberg are classified as Type 6. The type is further divided into three subtypes based on observed modes in the weight index.

#### SUBTYPE 6A

Subtype 6A contains Type 6 points whose weight index is less than 850. This comprises 16 points recovered from seven sites. Multiple occurrences are recorded for SBA-210 and 734. SBA-215, 643, 665, 1001, and 1028 each have one specimen recorded. Material varies, although Monterey chert dominates the assemblage (69%). SBA-215 and 665 are represented by Franciscan chert specimens. SBA-1028 and 734 each record one unidentified form of chert. SBA-734 contributed a fused shale specimen.

The six specimens from SBA-210 can be divided into two groups based on vertical distribution: three specimens from surface to 40 cm, and three specimens from between 80 and 120 cm. Vertical control at SBA-210 does not allow temporal distinctions discrete enough to enable interpretation of these divisions. Nonetheless, correlation of the uppermost levels of the site with the protohistoric period has been confirmed by bead analysis. All other sites are represented exclusively by surface finds with no known temporally diagnostic associations.

Greenwood's Type 2a (1972:16) does not differentiate between small leaf shaped points with oval bases and those with which constrict to form pointed terminations. Therefore, temporal and spatial data relevant to the Diablo Canyon area is discussed with reference to Subtype 4A of this study.

Outside this Santa Barbara region, i.e., the California desert, Owens Valley, and the Great Basin, Subtypes 4A and 6A are termed Cottonwood Leaf and Bipointed respectively (Lanning 1963; Heizer and Clewlow 1968; Heizer and Hester 1978). The literature has very little reference to the latter style and it is assumed that descriptions of the prior, that is Cottonwood Leaf, include those points that sub-division would designate as Bipoints. This assumption gains support when Greenwood's (1972) report on Diablo Canyon is considered as an example of this collective approach.

Lanning (1963; Moratto 1984:375) proposed a cultural sequence for the northwest Mojave and Owens Valley. He did so by "cross-dating of diagnostic artifacts to areas for which an absolute chronology was established." The Cottonwood Creek Site in the Owens Valley (H. Riddell 1951; Moratto 1984:373) became the type site for the triangular and leaf shaped forms of the late prehistoric. Lanning's Phase VIII, Late Cottonwood (A.D. 1840-1900) denotes the first appearance of Cottonwood Leaf-shaped points. Whereas, the first appearance of his Cottonwood Triangular points is placed in Phase VI, Late Rose Spring (A.D. 500-1300) and is dominant during the Phase VII, Early Cottonwood (A.D. 1300-1840). This extremely late occurrence of the Cottonwood Leaf-shape type in this area would indicate a eastward migration of the style.

Data from the San Joaquin Valley are presented by Wedel (1941) as a report summarizing his work with the Civil Works Administration at Buena Vista Lake in Kern County. His work at KER-60 and 39 unearthed dense midden deposits associated with the prehistoric and protohistoric-historic ages, respectively (Wedel 1941; Moratto 1984:186); as well as Early Horizon components in the lower strata.

Wedel (1941:61) reports that Strong's (1935) Type NAb1 points were "second in order of abundance" with relation to Strong's (1935) Type NBb (Wedel: 1941:63). Type NAb1 and NBb are equivalent to Cottonwood Leaf-shaped and Triangular, respectively. He emphasizes of the entire Leaf-shaped collection "these are all of cherty materials, obsidian being totally absent." Eighty-six Type NAb1 were recorded for Wedel's Site 1 (KER-39) (Wedel 1941:Table 8). Type NAb1 was found at "slightly greater depths than NBb form, but otherwise parallels the occurrence of the latter".

Reference to this form outside of Southern California are spurious. Many reports from the Sierra Nevada region elude to the Cottonwood Series, but upon further examination, only Cottonwood Triangular points are documented. Proximity to the Owens and San Joaquin Valleys and seasonal transience would undoubtedly lead to the type being, at least, represented in the southern Sierras.

Evidence for the type in the Great Basin is also sparse. Thomas (1981:16) proposes that Cottonwood Triangular and Leaf shapes are coeval. He does, however, regard the latter as rare in the region (no examples were recovered from Gatecliff Shelter). Thomas (1981) dates both types in the series at post-A.D. 1300.

#### SUBTYPE 6B

Subtype 6B includes Type 6 points with a weight index between 850 and 1400. Ten specimens are present in the Vandenberg collection: five from SBA-210, two from SBA-734, and one each from SBA-209, 552, and 988. Length ranges from 46 to 65 mm; width ranges from 18 to 25 mm.

The SBA-209 example is made from Temblor Range chert. This is an extremely fine, waxy form of chert and is rarely recovered from Santa Barbara County sites. One example from SBA-210 is of an unidentified chert; the remainder of the specimens are made from Monterey chert.

Stratigraphic position of the specimens at SBA-210 ranges from 60 to 360 cm below surface. This range encompasses radiocarbon dates of 2240 B.P. and 3530 B.P.; in addition, an anomalous date of 9050 B.P. is included. Temporal data on the upper levels of the site are still forthcoming. cursory examination of beads infers a Late period Component in the

upper levels. Temporal information for SBA-552's specimen is also lacking, similar bead data are available.

Comparative data at Greenwood's Diablo Canyon excavations consist of Greenwood's Type 2b descriptions. As with her Type 2a, Greenwood did not sub-divide her sample based on round versus pointed base specimens; therefore, the reader is referred to the discussion of Subtype 4B of this analysis for further details regarding spatial and temporal comparisons.

#### SUBTYPE 6C

Subtype 6C is represented by 12 examples from seven sites and two isolates. A weight index over 1400 qualifies these Type 6 specimens to inclusion in the subtype. Length ranges 51 to 146 mm, with both being extreme examples. The median length of 76 mm is more representative of the group as a whole. The extremes expressed in the length are mirrored in the minimum and maximum width measurements: 16 and 44 mm. The median width of 33 mm is more characteristic.

Two example are present from SBA-210, three from SBA-552, and one each from SBA-549, 662, 1001, and 1005. The SBA-1005 example is made from Franciscan chert; the remainder are Monterey chert.

The bulk of the sample represents surface finds. However, SBA-210 and 552 specimens are found within the strata and be discussed in relation to supporting radiocarbon dates from the respective sites. Both specimens from SBA-210 were recovered from between 260 and 280 cm. This level is bracketed by radiocarbon dates of 2240 B.P. and 3530 B.P. placing the specimens roughly in the early phases of the Middle period.

The three specimens from SBA-552 are distributed between 20 and 160 cm. The lowest specimen is closely associated with a radiocarbon date of  $7550 \pm 90$  (C-13 Adj.). This date seems justified given the series of dates from this stratigraphic sequence. This would temporally place the specimen in the earliest recorded phase of the Early period.

Glenn's (n.d.:15) study contained three specimens from three sites, only one of which, SBA-485, is not associated with the Vandenberg collection. Temporal information derived from obsidian hydration data indicates that this site is represented by both Early and Late period components (Macko 1983). Earlier assessment, based on bead seriation, had ascertained that only the Late period was represented.

Greenwood's (1972:19) report discusses Leaf shaped blades with round and tapered bases: Type 1a. This blade type is comparative to the one presently under discussion. It is therefore appropriate to refer the reader to the discussion of Subtype 4C were comparisons to Greenwood's Leaf shape blade variety (1a) is applied.

Discussion of the subtype outside the region entails those points assigned to Subtypes 5B-C, and 6B-C. Summary data from several reports include size ranges (length and weight), as well as illustrations, which encompass these subtypes (M. Rogers 1939; Harrington 1948, 1957; Treganza and Bierman 1958; Warren and True 1961; Wallace 1954; Jones 1956; Heizer 1949). Temporal assignment based on these reports indicate a life span in excess of 5500 B.P. Spatial distribution is documented throughout Southern and Central California and, if research time permitted, would probably be found to entail a much greater area.

## Type 7: Hipped (Figure 5)

Hipped points are those with excurvate blades and concave bases. Based on Glenn's study (n.d.:15) four subclasses relating to weight index variation are proposed. Only the largest subtype (7D) is represented in the Vandenberg collection.

Examination of Glenn's data summary indicate a Subtype 7C specimen from Vandenberg. Reassessment during this analysis has placed this specimen with points of comparable morphology, i.e., Subtype 1C. Rigid adherence to divisional criteria during the previous study forced the specimen into the hipped class based on subtle, but measurable differences in maximum width location. These divisional requirements were applied without regard to overall morphological continuity between comparable specimens.

### SUBTYPE 7D

The Subtype 7D specimen was recovered from the surface of SBA-1010. It is made from grey/green granular obsidian with no visible flow lines. The basal fragment recovered shows evidence of snap fracture traditionally associated with impact. The maximum measurable width is 28 mm. Comparison with morphologically similar specimens would indicate that complete width was probably slightly wider than that represented by the fragment. Using the maximum measurable width and the 2.234 multiple applied to other lanceolate forms, a minimum complete of 63 mm was calculated. Width/length ratio calculations performed on illustrated specimens would indicate a multiple of between 2.5 and 3.0 is applicable. If the 3.0 multiple is used, minimum length would measure 84 mm.

Limited analysis of flaking patterns are possible given the portion of the point represented. Moreover, overall morphology and pressure flake scars indicate a skilled knapper applying advanced techniques. Pressure flake scars on the blade indicate a parallel patterning with the greatest portion of the scars terminating in a step fracture. I believe this is a result of the stone's mechanical limits and does not reflect a lack of skill on the part of the knapper. Blade edges are lightly ground in the basal area. The basal concavity is carefully formed and thinning is executed using a series of pressure flakes. No basal grinding is visible.

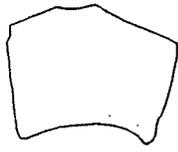
Temporal data currently available for SBA-1010 are restricted to a single radiocarbon date of  $2240 \pm 160$  (UCR-269). As discussed previously, this date is associated with the second phase of King's (1981) Middle period. Analysis of a Subtype 2J point found at SBA-1010 indicates that the site may be contemporaneous with phase I of the Tank Site (LAN-1). Johnson (1966; Moratto 1984:127) dates Phase I at LAN-1 to "earlier than 3000 B.C." (5950 B.P.).

No reference to comparable specimens have been located within the region. Discussion of comparable specimens outside the region has imparted an additional element of confusion to the analysis this point subtype and SBA-1010 in general. Two references appear applicable: Tulare Lake forms and those lanceolate points associated with the Middle Horizon of Central California.

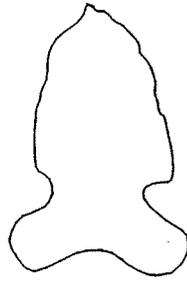
Surface finds at the Witt Site are associated with the ancestral edge of Tulare Lake. Based on typological comparisons with associated fluted points, the type represents points 12000 to 11000 years old (Riddell and Olson 1969; Moratto 1984:82). Illustrations indicate that this type is technically inferior to the specimen being analyzed.

Type 7

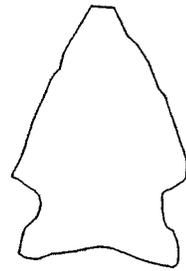
Type 8



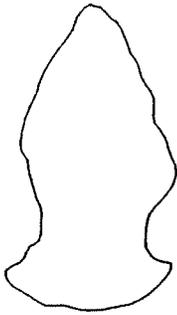
7D



8A



8E



8I



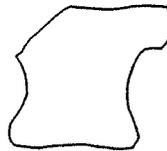
8J



8L



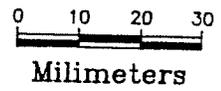
8M



8N



8O



Millimeters

Figure 5. Projectile Point Types 7 and 8 showing examples of subtypes.

The second, and more promising, comparison references the Middle Horizon assemblages of the Central Valley's Delta area. At the Morse Mound (SAC-66) a "Transitional period" between the Early and Middle periods in the Central Valley sequence was first recognized (Lillard et al. 1939; Moratto 1984:180). Twelve sites with similar assemblages were documented. Among the similarities were tightly flexed burials, some of which contained grave goods. Large concave base projectile points were among the artifacts associated with the burials. Further work in the area can be used to infer the Middle Horizon shift originated in the San Francisco Bay region (Ragir 1972; Gaumer 1968; Moratto 1984:209). Related assemblages are referred to as the Berkeley Pattern (Fredrickson 1973; Moratto 1984:261).

The transition between the Berkeley Pattern (Middle Horizon) and its predecessor in the Central Valley may have continued over a millennium. Berkeley Pattern is recorded in the lower Sacramento Valley soon after 500 B.C. (3000 B.P.) (Moratto 1984:210) This date correlates reasonably well with the 2240 B.P. date from SBA-1010.

### Type 8: Expanding Tang (Figure 5)

Type 8 points are those which exhibit a proximal shoulder angle (PSA) greater than, or equal to,  $90^\circ$  (Figure A4.3 and A4.4). The divisional line at  $90^\circ$  relates to the observed lack of points with a PSA less than  $90^\circ$  at SBA-53 (the Aerophysics site), while those with PSA angle equal to, or greater than,  $90^\circ$  were plentiful (Rogers 1929, Harrison and Harrison 1966, Glenn n.d.). The type, therefore, includes side-notched, corner-notched, and parallel side stemmed points.

Twelve subclasses are posited by Glenn (n.d.:16-21). Within the current sample, nine sites and three isolates yielded a total of sixteen Type 8 points. These are subsequently assigned to eight subtypes.

#### SUBTYPE 8A

Qualification for inclusion in Subtype 8A was based on the lack of diagnostic traits which would allow assignment to a more discrete subtype. Glenn's (n.d.) study contained 78 Type 8 points, the majority of which were from the Aerophysics site (SBA-53). Eleven distinguishable subtypes were recognized and illustrated. However, a large portion of the specimens lacked divisive attributes. These specimens contained attribute values on a continuum and, therefore, were relegated to a conglomerated subtype (8A).

Subtype 8A is represented by two specimens in the Vandenberg collection: one each from SBA-209 and 530, both surface finds. Both specimens have pronounced basal ears that extend slightly beyond the maximum width of the blades. The point was probably triangular in form prior to notching. Bases are slightly concave. The notch opening index (NOI), proximal shoulder angle (PSA), and distal shoulder angle (DSA) are nearly equal for both specimens. PSA measurements of these specimens expresses well developed ears, whereas, the DSA measurements delineate slight up-sloping of the shoulders.

The SBA-209 specimen is made from an unfamiliar, banded, siliceous material. Remnant scars suggest it was made from a flake blank. A minimal amount of work was expended in its manufacture as is evinced by the asymmetric outline. The point is complete with the exception of a missing basal ear, but still serviceable. The near complete

condition, lack of rejuvenation, and a large pot-lidding scar on the ventral surface would suggest that the owner may have been dissatisfied with the point and abandoned it when access to a lithic resource justified it.

The specimen recovered from SBA-530 is made from a fine quality Franciscan chert. Contrary to the SBA-209 specimen, this specimen has been utilized to its fullest. The specimen can be termed complete, but it has undoubtedly been subjected to rejuvenation. The point is presently 31 mm in length. Using the width to length ratio of the SBA-209 specimen as a guide, .5:1, complete length of the specimen would be approximately 48 mm.

Temporal data for are available for both sites in the form of radiocarbon dates. SBA-209 is represented by a single date of  $7890 \pm 350$  (UCR-253). This date can be placed into the earliest recorded phase of King's (1981) Early period. A suite of four dates record two major components for SBA-530. The latest date ( $840 \pm 70$  Beta-17259) refers to the last phase of the Middle period. Three earlier dates range from the  $7830 \pm 350$  (UCR-257) to  $8430 \pm 120$  (Beta-17260) with a third date between these two. These dates refer to the earliest recorded phase of the Early period and an undefined era.

Glenn's study (n.d.:17) analyzed 39 Subtype 8A points: 23 from SBA-53 (Aerophysics Site), one from SBA-84, four from SBA-585, and the two points contained in the Vandenberg collection. Apart from the Vandenberg specimens, temporal information is available for all three sites. SBA-53 is dated using radiocarbon techniques, whereas, SBA-84 and 585 are dated using bead seriation.

D. Rogers (1929) investigated the SBA-53 (Campbell No. 1) as part of his coastal settlement survey. Rogers references the points found on this site and asserts that they are "large, business-like weapons" (Rogers 1929:146). Rogers uses this deposit as his type site for describing the "Hunting People".

Excavations at SBA-53 were conducted by N. Gabel and W. Harrison in 1956, with interpretations presented by William and Edith Harrison (Harrison and Harrison 1966). Three radiocarbon dates were generated as a result of these excavation:  $4620 \pm 80$  (A-0303),  $4890 \pm 80$  (A-0302), and  $4980 \pm 60$  (A-0363) (Breschini et al. 1990). These date the site to the last phase of the Early period.

Analysis of bead data from the other two sites represent limited success. Temporal data from SBA-585 resulted from bead analysis. This analysis identified bead forms that dated exclusively to each of King's (1981) three periods, thus providing no temporally restrictive data. A similar analysis of SBA-84 bead materials is only partially complete. Thus far, preliminary examination has only resulted in the identification of beads from the Late period.

Harrison (1965) excavated at the Dos Pueblos village of *Mikiw* (SBA-78). Excavations revealed a two component site with the large side-notched points among the artifacts recovered. Harrison (1965:100) suggests that "all material reported here is restricted to the late occupation of this village". This point is contestable; however, as discussed in an earlier section, this report shall simply detail the associated radiocarbon dates and not attempt reanalysis of the sites assemblage.

Twelve radiocarbon dates are associated with SBA-78. They can be clustered into two groups: 180 to 250 B.P. and 3700 to 6830 B.P. (Breschini et al.1990). The most recent cluster represents the latter half of the second phase of the Late period. The earlier suite of dates comprises the entire scope of the Early period.

Side-notched points at Diablo Canyon are divided into two subtypes (5a and b). Subtype 5a includes wide stem examples and thus incorporates specimens comparable to Subtype 8A currently under consideration (Greenwood 1972:16). Twenty-one specimens were recovered from Site 1: 20 chert specimens and one obsidian. They are reported to "predominate in the lower levels."

Two dates are associated with the lower levels of Site 1:  $8960 \pm 190$  (GAK-2044) and  $9320 \pm 140$  (UCLA-1686A). Both of these predate the lower limits King's (1981) recorded sequence. These dates were taken from 290 and 320 to 330 cm below the surface. A later date, taken from 120 cm, returns a date of  $930 \pm 50$  (UCLA-1686B). The majority of Greenwood's Subtype 5a points occur between the 120 and 250 cm levels, with no recorded specimens below 270 cm. It is approximately this segment of the deposit (130 to 230 cm) that Greenwood (1972:Figure 2) illustrates as representing the Hunting Culture.

Carter's (1941) excavations at Point Sal recovered Type 8 points (Strong's 1935 Type SCa and NBb). This type is present in all three of stratum, with the bulk of the specimens being assigned to Stratum I (the deepest stratum). Fewer points of this type are found in Stratum II, and still fewer in Stratum III (Carter 1941:215). Carter equates Strata I and II with D. Rogers' Hunting period and Stratum III with the Canalino period.

Carter makes no attempt at dating these cultural manifestations in time. He does, though, propose two phases for the Hunting period. The first phase is marked by continued use of the metate and the introduction of notched blades. The second phase shift emphasis towards use of the mortar and the stemmed type blade (Carter 1941:223).

Meighan's (1959) excavation at Little Harbor on Santa Catalina Island recovered six large side-notched points (Meighan's Type 3). He described the site's complex as fitting into Wallace's (1955) Intermediate period (Meighan 1959:383). He noted the morphological similarity of Little Harbor side-notched specimens to those assigned to the Early Horizon of Central California (Heizer 1949) and that the "complete lack of long stemmed forms" might be representative of a temporal or spatial distinction (Meighan 1959:389); an observation reminiscent of Carter's (1941) Point Sal interpretation.

At Topanga Canyon (LAN-1 and 2) five points can be classified as Type 8: four Subtype 8A and one Subtype 8E (Treganza and Bierman 1958:61, Plate 22-23). These are all associated with Phase II components of the sites. Radiocarbon dating allowed Johnson (1966; Moratto 1984:127) to date the Topanga Canyon phases. Phase II was dated to between 5000 and 3000 B.P. These dates incorporate the second half of the Early period and the first phase of the Middle period.

The paucity of the subtype within the San Joaquin Valley is probably correlated with the strong, continuous influence from the Sacramento Delta region where contracting stem types dominate. Wedel (1941) recovered only a single Type 8 basal fragment from his Site 1 at Buena Vista Lake. The site was, instead, dominated by Late period triangular and leaf varieties. At Site 2, an earlier site, Wedel found a larger inventory of large, stemmed points. The proportion of contracting to expanding stem points was 35 to 6 (Wedel 1941:Table 8)

Heizer (1949:Figure 14) illustrates several Type SC (after Strong 1935) projectile points. The majority of these were recovered during excavation at C.56 (Phelps Settlement). Excavations at C.68 (Blossom Site), conducted by the University of California at Berkeley, recovered five Type SC points. The significance of projectile point types in the area is not elaborated; nor does Heizer summarize material/point type correlations. However, large side-notched points are seldom related to the Delta's Early Horizon

assemblages. From this, we may infer that they represent contact with peoples outside the Delta; this aspect of the Early Horizon is well documented (Heizer 1949:34; Moratto 1984:206).

True and Beemer (1982) report several occurrences of large side-notched points at Rincon 301 (SDI-9537) in San Diego County. They regard this point type as "evidence of the Campbell Intrusion proposed by Warren (1968:2-6)" (True and Beemer 1982:238). Moratto (1984:Figure 4.17) illustrates the concordance of archaeological units in the San Diego subregion. The La Jolla/Pauma Complexes, within which Rincon 301 is placed, span the period between 7500 and 3000 B.P., with a transition or hiatus lasting another 1500 years (ca. 1500 B.P.).

The source of this Campbell intrusion, if indeed an intrusion did occur, is thought, by some, to be the inland desert region of California (Warren 1968; D. Rogers 1929; Wallace 1978; Moratto 1984:163). The merits of this argument are beyond the scope of this analysis, but discussion of the occurrence of Type 8 projectile points in the desert region is warranted.

M. Rogers (1939) ascribes the large side-notched "dart" points found in north-central Mojave Desert to the Amargosa Industry. Rogers further proposes that the Amargosa Industry be divided into two phases based on different types of dart points and the presence or absence of arrow points and pot sherds. Rogers indicates the major difference in the dart types has to do with size and the angle of notching. Despite this, illustrations indicate the size aspect to be more diagnostic (M. Rogers 1939:Plate 16).

M. Rogers postulates a Pinto-Gypsum Complex antecedent for the Amargosa Industry. In addition, he feels that strong ties to the Basket Maker Horizon of Nevada is suggested, especially for Phase II of the Amargosa Industry.

Warren (1984) proposes a synthesis of the desert region. His Gypsum period incorporates, or correlates with, the Newberry period (Bettinger and Taylor 1974), the Gypsum Complex, including the Amargosa Industry (M. Rogers 1939), Middle Rose Spring (Lanning 1963, Clewlow et al. 1970), and several other localized manifestations (Warren 1984:414-420). Warren places the Gypsum period between 4000 and 1500 B.P. with the Pinto period as its predecessor and the Saratoga Springs period succeeding it.

Type descriptions for the desert appear to vary to a degree. Side-notched points described by M. Rogers (1939) as belonging to the Amargosa Industry are later described to be a variant of the Elko Series (Lanning 1963; Moratto 1984:376).

Heizer and Hester's (1978) synopsis of Great Basin projectile points includes reference to several point types that would be considered Type 8 point; among them are the Elko Series, and the Northern Side-notched Type. Several other types found in the Great Basin Region qualify as expanding stem points, but discussion herein is limited to those types comparable to the Vandenberg sample.

The Elko Series was originally defined by Heizer and Baumhoff (1961) and includes several varieties: "side-notched", "eared", and "corner-notched" (see also Heizer and Hester 1978:5). The type is found throughout the Great Basin and is especially abundant in the central and western areas of the region. O'Connell (1967; Heizer and Hester 1978) postulates an introductory date between 3500 and 2500 B.P. in the central and western subregions. He proposes a terminal date for the type between 1500 and 1400 B.P.

The Northern Side-notched Type was first proposed by Gruhn (1961; Heizer and Hester 1978) and encompasses several varieties. The bulk of the specimens are found in the northern limits of the Great Basin and into north-east corner of California. Layton (1970; Heizer and Hester 1978) postulates that the series predates the introduction of the "Silent Snake" Type (cf. Pinto). The type is believed to cover a long time span and are dated as part of the Menlo Phase, ca. 7000 to 4000 B.P. (O'Connell 1971; Heizer and Hester 1978)

Thomas' (1981) Monitor Valley typology lumps all previously defined Great Basin large side-notched types including: Northern Side-notched, Bitterroot Side-notched, Madeline Dunes Side-notched, Elko Side-notched, and Rose Spring Side-notched. Thomas adds little to the temporal framework of the large side-notched point. He simply places them earlier than A.D. 1300, but "certainly older than Desert Side-notched points".

Subsequent Type 8 subtype descriptions will, where appropriate, reference the preceding discussion. This will, for the most part, encompass all subtypes to which the term "large side-notched" could be applied. Subtypes, other than "side-notched", comparable to specifically defined types within, and outside the Santa Barbara subregion will be dealt with during discussion of that particular variety.

#### SUBTYPE 8E

Subtype 8E incorporates points that can be termed "eared" (Binford's lateral-coincidental juncture) with the basal ears being equal to the area of maximum width (Binford 1963:212). One such specimen is represented in the Vandenberg collection. The specimen was recovered from the surface of SBA-209 and is made of fine quality Monterey chert. The specimen is fragmented, but does retain its maximum width (29 mm). Fine pressure flaking is evident on both the blade and basal areas. Pressure flakes, originating on the blade, run in excess of half the width of the point. Comparison with the Subtype 8A specimen recovered from the same site strikes a marked contrast that can be attributed to the quality of the stone being worked.

The single radiocarbon obtained from the site dates to  $7890 \pm 350$  B.P. This date indicates that the site was occupied in the earliest recorded phase of the Early period. It should be noted that the surface of the site, from which the specimen was acquired, may be considerably younger than the date applied to the lower levels of the deposit.

Glenn's (n.d.) study recognized one Subtype 8E specimen in addition to the Vandenberg specimen. This was recovered from excavations at SBA-53 (Harrison and Harrison 1966). Additional temporal data for the subtype can be gathered with reference to Subtype 8A descriptions. Special attention should be given the descriptions of the Amargosa Industry and the Elko Series to which Subtype 8E has strong correspondence.

#### SUBTYPE 8I

Subtype 8I consists of those Type 8 specimens with a pronounced convex base. Three such specimens were identified, one each at SBA-210, 552, and 734. The SBA-734 specimen is made from Franciscan chert, whereas the other specimens are made from Monterey chert. The SBA-552 and 734 specimens are surface finds. The SBA-210 example was recovered from between 180 and 200 cm below the surface.

All three specimens appear extremely rough in outline with pressure flaking being somewhat intermittent. The SBA-552 specimen can be considered complete, but rejuvenation is suggested. The SBA-210 specimen is broken in the midsection. Heat and impact fractures are both evident. The specimen from SBA-734 is missing the tip of its long, constricted blade. Length ranges from 50 to approximately 80 mm.

Temporal data are available for SBA-210 and 552; no temporal data are currently available for SBA-734. A date of  $2240 \pm 150$  B.P. was obtained from between 180 and 200 cm at SBA-210, thus providing the closest associated date for the point. This date relates to the second phase of the Middle period. Radiocarbon dates for SBA-552 correlate with the entire range of the Early period. Bead and ethnographic data indicate a Late (protohistoric) period for both sites.

Greenwood (1972:Figure 9h, center) illustrates a comparable specimen. She includes this specimen in Type 5b (Side-notched, narrow stem). Fewer Type 5b specimens are recorded for Site 1 relative to Type 5a. They do, however, share vertical patterning within the site. Five specimens are recorded between 180 and 230 cm. Four other specimens are widely scattered upward over the next 150 cm. The matrix between 130 and 230 cm is assigned to the Hunting Culture.

#### SUBTYPE 8J

Subtype 8J include Type 8 points with extremely straight, well defined bases and notches situated low on the point (lateral-coincidental juncture) (Binford 1963:212). Basal width is less than, or equal to, the maximum width of the point. Four examples are present in the Vandenberg collection: 2 from SBA-552, one from SBA-670, and one isolated find. All specimens are fragmented. Nonetheless, the range of complete length can be estimated at between 55 and 85 cm.

Workmanship varies in quality, but is superior to that exhibited on Subtype 8I. It is instead, more reminiscent of Subtype 8E. Pressure flaking is systematic and results in a parallel pattern with flake length exceeding half the width of the point. Original flake detachment scars on two of the specimens indicate the points were formed, at least in part, from flake blanks.

Three of the specimens are made from Monterey chert and the fourth from an unknown material that is dull white and red with evidence of layering. The isolate and the SBA-670 specimens are surface finds. The SBA-552 examples are represented in two levels: from 60 to 80 cm and from 160 to 180 cm. The specimen of unfamiliar material was from the upper level (60 to 80 cm).

Temporal data are available for both SBA-552 and 670. Two suites of dates at SBA-552 appear relevant to the Subtype 8J specimens. Dates obtained from between 140 and 520 cm in unit 9 relate to the entire span of the Early period. A single date of  $3630 \pm 200$  B.P. was extracted from the 140 to 160 cm level of Unit 1, the unit of origin, and the level above the Monterey chert specimen. This date correlates with the last phase of the Early period.

Two periods are represented by radiocarbon dates from SBA-670: the Late and the Early periods. Dates for the Late period range between 490 and 590 B.P, the latter two sub-phases within phase 1. Early period dates are more specifically related to the second

sub-phase of the middle Early period and the late Early period (Eyb and Ez, respectively) (King 1981).

Glenn's (n.d.) study contains seven Subtype 8J specimens in addition to the Vandenberg examples. All seven were recovered from SBA-53. Temporal data available from this site has been fully discussed during temporal discussion of Subtype 8A. In brief, the site dates to the latter sub-phase of the second phase of the Early period (Eyb).

Greenwood (1972) includes this variety in her Type 5a. Temporal data relevant to this type has been addressed in the temporal discussion of Subtype 8A. The reader is referred to that section for more detailed temporal and spatial data.

#### SUBTYPE 8L

Subtype 8L is defined as small, narrow based, expanding stem points. Only one example was recorded in Glenn's (n.d.) study, and that example is the Vandenberg specimen currently being discussed. It is made from Jasper and was recovered from the surface of SBA-1001. It is all but complete with only the extreme tip being absent. Maximum complete length is estimated to be 35 mm. Maximum width is 13 mm, with a maximum basal width of 10 mm. The specimen is made from a flake with the proximal end (base) of the point being the distal (terminal) end of the flake.

Greenwood's (1972) study contains no specimens comparable to the Vandenberg specimen in all aspects. However, her Type 5b description and illustration fit the Subtype 8L morphological description quite well. Greenwood's smallest Type 5b specimen is 46 mm long and associated with specimens up to 57 mm in length. As discussed previously regarding Subtypes 8E, 8I, and 8J, Greenwood's Type 5b relates to the lower and middle strata of Site 1 and has been assigned to the Hunting Culture.

Size and weight of the specimen would indicate that is suited for use as an arrow point. This trait is shared by several points recovered from SBA-1001 (Subtypes 6A and 6B). It is possible that this specimen represents an example of transition between the use of atlatl and the bow.

Reference to the subtype within the Santa Barbara Channel region are notably scant. This would tend to substantiate the transitional nature of the subtype. One San Joaquin Valley example is illustrated by Wedel (1941:Plate 39.d). Excavations at Site 2 (KER-60), Buena Vista Lake, exhibited point types associated with Delta Late Horizon. Cross-dating of projectile point types, especially Cottonwood Series and Desert Side-notched using Lanning's (1963) data from the Owen Valley, indicates occupation extended well into the late prehistoric. This inference assumes contemporaneity of the types within these two regions. The Wedel specimen is made of obsidian and was likely a trade item "from the Sierras and beyond" [Owens Valley?] (Wedel 1941:156). This would give additional credence to the use of Lanning's chronology.

Lanning's Rose Spring Side-notched is the single most comparable morphological type (Lanning 1963:252, Plate 7a). Lanning reports the type's first appearance during Middle Rose Springs (circa 500 B.C.). Rose Spring Side-notched points are found in association with Cottonwood and Desert Side-notched Series throughout the upper levels of the Rose Spring Site indicating survival of the type well into the late prehistoric (Lanning 1963: Table 3).

#### SUBTYPE 8M

Subtype 8M is defined as large, narrow-based expanding stem points. Two Subtype 8M points are represented in the collection, one each from SBA-552 and 734. The SBA-552 specimen is made of Franciscan chert; the SBA-734 example is made from Monterey chert. Subtype 8M differs from Subtype 8L based solely on overall size. Length of the Subtype 8L specimen and the SBA-734 Subtype 8M specimen, the complete and predictably smaller example, are nearly equal (approx. 35 versus 38 mm, respectively). Notwithstanding, the weight index better measures size contrast. The 8L specimen is only 52 % as large as the 8M specimen, relative to the weight index (455 versus 874). The SBA-552 specimen is a basal fragment, but is probably 50 % larger than the SBA-734 example using maximum basal width as a guide.

The SBA-552 specimen was recovered from between 0 and 20 cm below the surface. Temporal data gained from radiocarbon assay indicate the site represents an Early period occupation. However, the upper-most date was taken from between 140 and 160 cm below the surface. Preliminary bead analysis indicates a Late period component in addition to that infer by radiocarbon data. Thus, no specific temporal associations can be made with regard to the specimen. No temporal data are currently available from SBA-734.

#### SUBTYPE 8N

Subtype 8N represents large, Type 8 points with narrow expanding bases scarcely exceeding a PSA of 90°. In all probability, this subtype is equivalent to Subtype 8M and the two subtypes should be merged. Two specimens are recorded: one from SBA-931 and one isolated find.

The isolated find is made from moderate quality, mottled Monterey chert. The specimen is highly fragmented, apparently due to both impact and heat fracture. Neither maximum length or width can be discerned. Nonetheless, complete dimensions are probably close too, or greater than the SBA-931 specimen.

The SBA-931 specimen was found between 40 and 60 cm below the surface. It is made from good quality, brown Monterey chert. The specimen is complete, except for a flake having been removed from the blade. Whether the damage is recent, is not immediately obvious. Pressure flaking is minimal. Lack of quality workmanship can not, in this case, be attributed to inferior stone. The presence of remnant scars indicates the point was made from a flake blank. A substantial amount of damage is evident over most of the edge. Complete length is 65 mm and maximum width is 27 mm.

Temporal data for SBA-931 indicate occupation prior to the early limits of King's (1981) recorded chronology. The open ended format of the chronology allows for the addition of phases preceding those described in King's dissertation. Analysis of the entire assemblage will determine if the site represents an antecedent to the Ex phase, or simply redefines its earliest commencement.

#### SUBTYPE 8O

The single most provocative specimen in this type is labeled Subtype 8O. This subtype is an addition to Glenn's study. It is a projectile point resembling, in all respects, a Pinto

style point (Campbell and Campbell 1935:44). It is regrettable that this point was found as an isolate during construction monitoring and therefore has no observable associations. A similar basalt specimen from SBA-53 was previously assigned to subtype 8A (Glenn n.d.). Reference to Warren's Campbell Intrusion is presented above in the discussion of subtype 8A.

The point is chipped from an excellent quality chert of an unfamiliar variety and retains remnants of the original flake scars on both faces. Pressure flaking is evident, but is restricted to the edge of the point. Although the tip is missing, the specimen's estimated complete length ranges between 5.0 and 5.5 cm. Surface weathering is minor and occurs on both faces.

Harrington (1957) describes the Stahl Site collection of Pinto Type points in terms of five subtypes. The Vandenberg specimen would be placed in Harrington's "sloped shouldered" subtype (1957:51). Heizer and Hester (1978:5) place the Pinto Series between ca. 3000 B.C. - 700 B.C., they do so with reservation.

Their reservations are expressed with reference to the ongoing debate concerning the spatial limitations of the series (Layton 1970; O'Connell 1971). Layton (1970) refers to "Pinto-like" points as "Silent Snake Bifurcate Base," while O'Connell (1971) defines the "Bare Creek" Series (see also Heizer and Hester 1978:3-4).

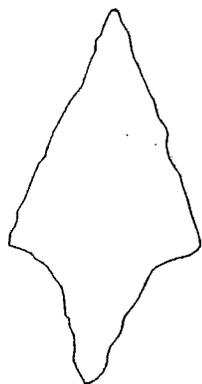
Radiocarbon dates associated with Pinto Type points range from 670 B.C. (2620 B.P.) at the Rodriguez Site, northeastern California (UCLA-1222) to 3550 B.C. (5400 B.P.) at Hanging Rock Shelter, northwestern Nevada (WSU-994) (O'Connell 1971; Layton 1970). A date of 1880 B.C. (3830 B.P.: GaK-2387) was made on an attached wooden atlatl dart foreshaft from Kramer Cave (Heizer and Hester 1978:4)

### **Type 9: Contracting Stem (Figure 6)**

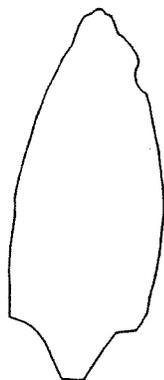
A total of 115 Type 9 points were identified. Type 9 points are defined as shouldered points whose stem (tang) has a proximal shoulder angle (PSA) less than 90°. The division point of 90° relates to the observed dichotomy within the collections in Glenn's (n.d.) study. As stated during the review of Glenn's study, Type 9 has been highly modified to allow use of more objective divisive criteria. Divisive criteria were limited to proximal and distal shoulder angles (PSA and DSA), and, in the case of Subtype 9Q, the presence of basal indentation. Use of these divisive criteria resulted in six subtypes being discerned in the Vandenberg collection. These were arrived at using the following procedure.

Proximal and distal shoulder angles were examined for modality. A dichotomy was observed in the distribution of proximal shoulder angles (PSA); the division was placed between 60 and 65°. Each of the two groups was examined to determine modality within the distal shoulder angle values. Two modes were distinguished within the lower PSA group. The DSA attribute was divided between 165 and 170°. Three modes were observed within the higher PSA group: less than 165°, between 165 and 200° inclusive, and greater than 200°. Subtype designations are based on the most comparable subtypes of Glenn's (n.d.) analysis. A single specimen, notably of imported obsidian, contained a basal indentation. This specimen retained the subtype designation (9Q) applied in Glenn's study (n.d.:25).

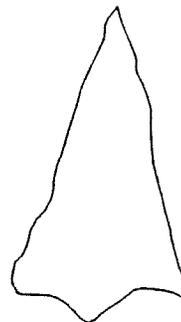
Type 9



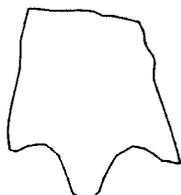
9A



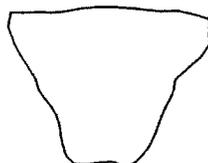
9H



9M



9P



9Q



9S

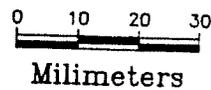


Figure 6. Projectile Point Type 9 showing examples of subtypes.

Each of the subtypes was examined to determine if the correlation between width and length of whole specimens was sufficiently strong to justify using complete width to estimate complete length. Although presumptuous given the small number of complete specimens, between 8 and 13, positive correlations between 0.959 and 0.976 indicated a strong relationship between the variables. A simple regression formula was applied, in order to determine the proper multiplier for each subtype.

#### SUBTYPE 9A

Subtype 9A consists of Type 9 specimens whose proximal shoulder angle is greater than, or equal to  $65^\circ$  and whose distal shoulder angle is between  $165^\circ$  and  $200^\circ$ , inclusive. This subtype contains the most specimens of any Type 9 subtype (44). Length of complete specimens ranges from 28 to 66 mm; estimated maximum length is recorded at 84 mm. Attempts were made to identify modes within the length and weight index variable. Values were on a continuum, with only minor modes discernible.

The majority of the specimens were made from Monterey chert (68 %). Other materials represented included: Franciscan chert (13 %), Temblor Range chert (2 %), Santa Cruz Island silicate (2 %), fused shale (2 %), chalcedony (2 %), and several varieties of unfamiliar chert (9 %). The diversity of materials within this subtype is likely a function of sample size, rather than culturally correlated. However, the paucity of expanding stem points on the northern Channel Islands does presuppose temporal and/or cultural correlates which would necessarily relate to material movements.

Nineteen sites are represented by Subtype 9A specimens (Table 5). Temporal data are available for eight of sites. Discussion will include: number of specimens found, Stratigraphic placement, and associated chronometric and bead seriation data.

Two Subtype 9A Monterey chert specimens were recovered from the surface of SBA-209. Complete length is estimated at 84 and 56 mm. The larger specimen is likely a production failure, with crystalline inclusions providing a weak point. The smaller specimen is dark brown and tabular. The extreme base represents the remnant platform of the original flake. Workmanship is poor and probably reflects the poor quality of the stone.

Temporal information for SBA-209 is restricted to single radiocarbon date. A date of  $7890 \pm 350$  relates to the earliest recorded phase of the Early period. The sample was taken from a railroad cut and undoubtedly reflects the age of the lowest stratum. Surface deposits could presumably be much younger.

SBA-210 records the most subtype specimens of any site in the sample (13). Nine are made from Monterey chert, three from Franciscan chert, and one from an unfamiliar chert. Range of complete length is estimated between 29 and 74 mm. Concave, convex, and straight blades are all represented. Subtype divisions, beyond those already imposed, would likely lead to each specimen representing a discrete subtype. Workmanship varies within the sample; this appears to relate both to material quality and execution. Notable variation within the sample include: convex and straight base, width/length ratio between 0.33 and 0.74, presence of asphaltum, and unifacial rejuvenation resulting in beveling.

Deposition within the matrix ranges from surface to 480 cm with no large gaps discernible. The Franciscan chert specimens are represented in the lowest and middle strata and are notably

Table 5. Sites represented by Subtype 9A

SITE	COUNT
SBA- 207	1
SBA- 208	1
SBA- 209	2
SBA- 210	13
SBA- 215	1
SBA- 539	4
SBA- 551	2
SBA- 552	3
SBA- 609	1
SBA- 642	1
SBA- 652	1
SBA- 662	1
SBA- 670	4
SBA- 678	1
SBA- 688	1
SBA- 734	4
SBA- 931	1
SBA-1005	1
SBA-1019	1

absent from the upper two meters of the deposit. The single most impressive point is made from dull, red Franciscan chert and was recovered from between 460 and 480 cm below the surface. It represents the deepest occurrence of a projectile point on the site.

Radiocarbon dates from SBA-210 represent the Early and Middle periods. An anomalous date in excess of 9000 B.P. has also been recorded. Superficial examination of bead data has added information indicative of a Late (protohistoric) period component. Ethnographic data indicate that SBA-210 was likely the location of the aboriginal village of *Saspilil*. These data would indicate a long life history for contracting stem points in this area.

SBA-539 is represented by four specimens, all recovered from the surface. Three are made from tabular Monterey chert, while the fourth is made from what is presumed to be, Santa Cruz Island material. Estimated complete length ranges from 54 to 65 mm. The longest specimen is extremely narrow relative to most the other Subtype 9A specimens; width/length ratio is 0.33. The quality of workmanship is hampered by material quality. Nonetheless, skillful execution is represented by the removal of long pressure flakes. Traces of asphaltum remain on three of the specimens, including the Santa Cruz Island example.

Three radiocarbon samples were removed from SBA-539 between 10 and 100 cm below the surface. All three dates are representative of the second phase of the Middle period. These dates correlate well with one recovered from SBA-210.

SBA-551 yielded two specimens; both are made from Monterey chert. Complete length is estimated at 45 and 66 mm. Quality of workmanship is, again, hampered by stone quality. Tabular material often terminates in step fractures. Specimens examined in this analysis show no evidence of heat treatment. The smaller specimen does show the effects of heat, i.e., pot-lidding. This is, most likely, due to post-depositional modification.

Temporal evidence from the site supports the hypothesis suggesting the subtype was used during the Middle period. Two dates, taken from the same unit and level, represent quite different temporal affiliations, i.e., Middle and Late periods. Additional dates and/or diagnostics would be necessary to resolve the question.

Three specimens were recovered from SBA-552: two Monterey chert specimens and one fine grained chalcedony. Length ranges 43 to 66 mm. The largest specimen retains a flake scar indicating the original dorsal surface of the flake blank. This is an especially well proportioned specimen, precisely flaked, but with tabular cortex precipitating step fractures. The chalcedony example retains the original striking platform of the flake blank as its basal termination. The smallest specimen would probably suffice as an arrow point.

Temporal data from SBA-552 include a suite of radiocarbon dates and preliminary analysis of beads. Radiocarbon dates indicate occupation during the last and earliest recorded phases of the Early period, i.e., Ez and Ex, as well as one date which precedes the earliest phase. The last phase of the period is represented by one date, the earlier phase by four dates. Bead analysis from the site indicates a Late period component probably associated with the adjacent historic village of *Saspilil*. All three specimens were recovered above 100 cm in the deposit and, therefore, represent later depositional circumstances than those represented by radiocarbon data. The upper-most radiocarbon date was taken from between 140 and 160 cm below the surface.

A single Subtype 9A specimen was recovered from SBA-662. It is made from Monterey chert and exhibits a heat fracture along the horizontal plain of the axis. The

Greenwood (1972:16) reports that her Type 6a is "the largest single category on the site [Site 1], and occurs from top to bottom of the deposit". Within the chronology section of the monograph she states:

A point with triangular blade and broad, long contracting stem (6a) had the deepest occurrence at Site 1, although the side-notched point with wide base (5a) had the lowest midpoint in frequency distribution.

Analysis of Greenwood's tabular summary of projectile point distribution (1972:Table 4) and her graphic representation of cultural assignment of strata (1972:Figure 2) indicates that her Type 6a points do occur throughout the deposit. However, only three Type 6a points occur in the matrix assigned to the Oak Grove period. The majority of the occurrences are related to the two upper components with the upper most Chumash period component receiving the bulk of the specimens: 37 of the 53 total. This is, however, a measure of density. Analysis of percentage of types indicates that Type 6a represents 17% of the Chumash period points and 21% of the Hunting points.

Carter (1941:215) reports that stemmed points (SA and SB) were not present in his stratum I, while heavy side-notched points (SCA1) were present (exact counts are not provided) (type designations refer to Lillard et al. 1939). Stratum II contained both side-notched and stemmed types "in equal numbers" (Carter 1941:215). Stemmed points (SBA and SBb) represent 74 % of the points recovered from stratum III (the upper most stratum). Stratum III is reported to contain one "arrow point" beneath the surface and five more on the surface. No radiocarbon dates are available for these strata and, therefore, interpretations must be limited to seriation and associations. Carter (1941) postulates two phases for D. Rogers' (1929) Hunting People. This is represented archaeologically as a shift "from metate to mortar, and from heavy side-notched to stemmed projectile points" (Carter 1941:222).

Points similar in every respect to Subtype 9A were recovered from the Phase II components of Topanga Canyon (LAN-1 and 2) (Treganza and Bierman 1958:61, 70, Figure 4, Plates 22f, g, j, k and 23f). Materials represented include: basalt, chert, chalcedony, and obsidian. The association of Phase II artifacts with flexed burials correlates with D. Rogers' Hunting and Canalino periods (Treganza and Bierman 1958:70). Phase II at Topanga has been radiocarbon dated to ca. 5000 to 3000 B.P. (Johnson 1966; Moratto 1984:127). This antedates the occurrence of either the Hunting or Canalino cultures in the Santa Barbara region.

Wedel (1941) recovered five points comparable to Subtype 9A during his work at Buena Vista Lake in Kern County. These include Strong's Types SAB and SBb; these types were extremely rare at both sites. One each of Types SAB and SBb were recovered from Site 1 (KER-39), a Late Horizon site. Three Type SAB and one Type SBb were recovered from Wedel's Site 2 (KER-60); a site dated to the protohistoric phase of the Late Horizon. It should be noted that both sites recorded a Early Horizon component in the lower levels. Exact Stratigraphic provenience is available for the specimens, but cultural associations with the arbitrary one foot levels is not clear. Wedel does relate this component, including extended burials and stemmed points, to the Early Horizon of the Delta and with the Oak Grove/Early Mainland period of the Santa Barbara region (Wedel 1941:147; Heizer 1949; Rogers 1929; Olson 1930).

Inferred connections with the Early Horizon of the Sacramento Delta are well founded. Heizer (1949) developed a summary of material aspects of the this culture and posits explanations for cultural developments and spatial interactions. His analysis included detailed summary of four Delta region sites (C.56, C.68, C.107, C.142). This

analysis contained projectile point type summaries indicating a total of 132 points recovered. Of these, 56 (42%) are considered comparable to Subtype 9A of the current analysis. Heizer (1949:39) postulates a date of 4500 B.P. for the Early Horizon in the Delta region of California's Central Valley.

Great Basin point types morphologically comparable to Subtype 9A are designated by two names: Elko contracting stem, and Rose Spring contracting stem. The Rose Spring Series represents small points capable of being hafted on arrows. The Vandenberg collection is confined to points whose size would preclude their use in this manner. Further discussion of the Rose Spring Series, therefore, seems inappropriate. Elko contracting stem is discussed, in the literature, chiefly as it relates to the series. It would, therefore, be redundant to reiterate temporal discussions of the series as they are addressed in the discussion of Subtype 8A.

#### SUBTYPE 9H

Subtype 9H is defined as Type 9 points with a proximal shoulder angle less than 65° and a distal shoulder angle greater than, or equal to, 170°. Thirteen points in the Vandenberg collection meet these criteria. These represent eight sites and one isolate: SBA-210, 228, 609, 670, 734, 1005, 1010, and 1014. Of these sites, SBA-210 and 734 have multiple occurrences of the subtype, four and two, respectively. Monterey chert dominates with 10 examples, two are Franciscan chert, and one is made from obsidian.

Three modes within the weight index variable probably relate to function. Those points with a weight index less than 700 were most likely designed to function as arrow points. Points with a weight index greater than 700 and less than 2200 would have served as dart points. Points with a weight index greater than 2200 would be more likely to have served as knives or spear points.

A statistical analysis of the relation between weight index and weight in grams was informative. This was accomplished in two steps: measurement of correlation between the two variables, and a simple regression technique to allow for conversion. Pearson's correlation was measured between weight index and weight in grams for complete specimens, resulting in a positive correlation of 0.935. This positive correlation justified applying the regression formula to the sample. This resulting in a conversion multiple of 0.007, i.e., weight index times 0.007 equals weight in grams. This allowed for conversion of the weight index to a conventional measurement method. Thus, the divisions previously described represent 4.9 and 15.4 g, respectively.

Fenenga (1953:313) determined a bimodal distribution of point weights in his sample. The divisional point was placed between 3.5 and 4.5 g, with 3.7 % of the sample falling in between. Those points less than 3.5 g were determined, by archaeological and ethnographic data, to be arrow points. Fenenga tested other linear measurements to determine if analogous bimodal curves were present in his sample. He found that no single measurement, or algebraic statement reproduced the results generated using weight.

A data set of over 165 complete points was examined to determine if, in fact, a bimodal distribution could be recognized using the weight index. Divisions placed at a weight index of 100 presented a noticeably break in specimens at the 600 level. When converted to weight in grams, using the previously described procedure, 600 weight index units was equated with 4.2 g. In terms of Fenenga's (1953) analysis, this lies between his two modes. Thus it would appear that the weight index is a legitimate means of determining weight of

partial specimens, given a reasonably high correlation between length and width of complete specimens within a given type or subtype.

Temporal data are available for three of the sites represented by Subtype 9H: SBA-210, 670, 1010. SBA-210 represents occupation during the Early, Middle, and Late periods. The two small specimens were recovered from 80 and 140 cm below the surface. These levels are above the level related to the second phase of the Middle period. Likewise, the obsidian specimen, whose dimensions could not be determined, was found in the level above that represented by the M2 date. The large specimen, estimated at 13.6 g, was found between 400 and 420 cm below the surface. This is between two levels determined to be related to the latter half of the Early period.

SBA-670 is a multicomponent site representing the Early and Late periods. The single Monterey specimen associated with the site has a weight index of 2516 and, therefore, probably represents a spear point or knife. Pressure flaking is minimal and is restricted to basal modification. It is not clear to which locus the specimen belongs.

The SBA-1010 specimen is made from Monterey chert and exhibits evidence of heat damage. The specimen is made from a flake and, though attempts have been made at shaping through pressure flaking, displays a rough finish resulting from the tabular nature of the material. A weight index of 1334 translates to a weight of 9.3 g. Provenience data, aside from site location, are lacking for the specimen. Temporal data are, thus far, restricted to a single radiocarbon date of  $2240 \pm 160$  and relates to the second phase of the Middle period.

Specimens worthy of special comment, but not associated with dated sites, are those from SBA-734 and the isolate. The SBA-734 specimens have weight index measurements of 1512 and 560. These infer complete weights of 10.5 and 3.9 g, respectively. Both specimens are made on chert flakes: the larger of the two from Franciscan and the smaller from Monterey. Both exhibit exquisite parallel pressure flaking.

The isolate is made from tabular Monterey chert. Pressure flaking is restricted to the area around the tip and one segment of the blade. Its overall length is 99 mm and would have undoubtedly served equally well as a spear tip or knife. Rogers (1929:Plate 76) illustrates several examples as Canalino spear points.

Glenn's (n.d.:23) study consisted of points with features similar to those described for the current subtype, but was further restricted to those points with ovate blades. All of these specimens have been included in the present subtype. Those points recorded by Glenn (n.d.) were all part of the Vandenberg sample and, therefore, reflects identical temporal data.

Greenwood (1972) defines no points comparable in all ways to those of the current analysis. She does present a Type 6c "triangular blade with short stem contracting abruptly to a point". This definition applies to some of the specimens of the current analysis. However, in discussing the type, it is clear that she is referring to points similar to the Gypsum Cave point types. While comparisons between the current sample and Gypsum Cave point type can be made, Gypsum Cave points are much more comparable to Subtype 9M of the current study. Further discussion of Greenwood's Type 6a and relationships to Gypsum Cave points will, therefore, be reserved for discussion of Subtype 9M.

## SUBTYPE 9M

Subtype 9M is defined as Type 9 points with proximal shoulder angle of less than 65° and a distal shoulder angle of less than 170°. Three specimens are represented in the Vandenberg sample: one each from SBA-552, 782, and 1010. All three specimens are made from Monterey chert. Length ranges from an estimated 69 mm to 53 mm. The SBA-552 and 1010 specimens share this minimal measurement. The SBA-1010 specimen is formed on a flake with flaking restricted to the dorsal surface.

Temporal data are available for SBA-552 and 1010. Temporal data from SBA-552 are in two forms: radiocarbon dates and bead analysis. Radiocarbon data represent occupation throughout the Early period. Bead data represent occupation during the protohistoric phase of the Late period. Further analysis of the upper 1.5 m of deposit may reveal additional occupational components. SBA-1010 is represented by a single radiocarbon date of  $2240 \pm 160$ . This relates to the second phase of the Middle period.

Glenn's (n.d.) Subtype 9M included all specimens in the current subtype description. In addition, points with distal shoulder angle up to, and including 180° were included in the subtype. With this mind, a comparison is made between the two subtypes.

Glenn's (n.d.:40) lists five sites with which Subtype 9M is associated: SBA-167, 552, 574, 1010, and SLO-178. Three of these sites are dated exclusively to the Late period. SLO-178 is dated by radiocarbon assay at  $340 \pm 100$  (UCR-0790). This date relates to the second phase of the Late period. SBA-167 and 574 were dated using bead seriation to the Late period. Dates pertaining to SBA-552 and 1010 were discussed in the analysis of the Vandenberg specimens.

Subtype 9M is clearly comparable with Greenwood's (1972:16) Type 6a. She compares two of her Site 1 specimens with Gypsum Cave points found in the desert region of California. Three specimens were recovered from Greenwood's Site 1. Two of the specimens were recovered from the upper 20 cm of the deposit. The third specimen was excavated from between 160 and 170 cm below the surface. She assigns these levels to the Chumash and Hunting cultures, respectively.

Three other Greenwood sites are represented by her Type 6c: 6A, 7, and 8. One specimen from Site 6A relates to the deepest level associated with the Chumash period. Two specimens from Site 7 were both recovered from between 40 and 50 cm. These levels are well within those assigned to the Chumash period. Six specimens were recovered at Site 8. These were excavated from between 20 and 90 cm., all of which represent the Chumash period.

Analogies with Gypsum Cave points have been made for other collections within the Santa Barbara Channel area. Orr (1968:158) reports Gypsum Cave Type points associated with flexed burials at Early Dune sites. Some of these points were imbedded in the bones and were, at least in part, responsible for the death of the individual. Other examples (Orr 1968:171-172) were found as grave goods in great numbers. Illustrations of some of these specimens points out the high degree of variance within the type (1968:Figure 53, 58). This undoubtedly stems from the lack of rigid type definition and the loose comparisons drawn by Harrington (1933:105-109, 114-120). It is clear that some of Orr's Gypsum Cave Type points are quite similar to Subtype 9M of the current analysis (Orr 1968:Figure 53). A date of 3400+ B.P. is proposed for cemetery A, the cemetery from which a point comparable with Subtype 9M was recovered.

The Gypsum Cave Type was originally described by Harrington (1933) as a result of his excavation at the site of the same name. The type was originally believed to date from Paleoindian times because of apparent association with extinct fauna. More radiocarbon dating has established that the site was occupied in more recent times. The Gypsum Cave points found at the site are now believed to date between 2400 and 2900 B.P. (Heizer and Berger 1970; Heizer and Hester 1978).

Bettinger and Taylor (1974:14; Heizer and Hester 1978:15) include the type in the "Newberry period" of southern California, dating at ca. 3150 to 1350 B.P. Lanning (1963) includes Gypsum Cave points in Phase IV, Early Rose Spring (ca. 3500-2500 B.P.) of the Owens Valley. He reports the type continues into Phase V, Middle Rose Spring (ca. 2500-1500 B.P.) (Lanning 1963; Moratto 1984:376). Enfield and Enfield (1964; Moratto 1984:388) report the type in Mammoth Creek Cave in Mono County. Such evidence indicates the known northern geographical limits of the Gypsum Cave Type.

#### SUBTYPE 9P

Subtype 9P is defined as Type 9 points whose proximal shoulder angle is greater than, or equal to, 65° and whose distal shoulder angle is less than 165 degree. The Vandenberg collection contains 22 specimens representing 14 site and two isolates (Table 6). Lithic materials include: 18 Monterey chert, 1 Franciscan chert, 1 Temblor Range chert, 1 unfamiliar chert, and 1 unidentified fine grained meta-volcanic. Estimated complete length ranges from 36 to 68 mm, with one anomalous specimen having a length of 95 mm. Width to length ratio varies from 0.38 to 0.83.

Workmanship of the subtype specimens varies from fair to excellent. The 95 mm specimen, from SBA-555, exhibits superb craftsmanship, with long, evenly spaced pressure flakes and deep, well formed basal notches. Most of the specimens retain flake scars pertaining to their origins as flake blanks. Blades are, for the most part, straight. Exceptions represent both slightly concave and convex forms. Concave blades display the greatest portion of their arch towards the proximal end, just above the shoulder. One specimen, from SBA-210, exhibits unifacial rejuvenation, which has removed a great deal of the margin.

Temporal data are available for seven of the twelve sites. Two of these, SBA-209 and 712, are each represented by a single radiocarbon date. In both cases, the dates refer to the earliest recorded phase of the Early period.

Vertical distribution of Subtype 9P specimen at SBA-210 can be divided into three clusters: surface, between 80 and 100 cm, and between 160 and 180 cm. All three of these clusters are related to strata above those for which radiocarbon data has been obtained. To reiterate, a protohistoric component is known at the site and the upper most radiocarbon date relates to the second phase of the Middle period. Radiocarbon dates taken from between 340 and 540 cm relate to the Early period and its antecedent.

The two specimens recovered from SBA-539 are grouped with points having an extremely high width to length ratio: 0.83 and 0.66. This arrangement produces large formidable barbs. Workmanship is not superior, but both specimens are well formed and fully capable of being hafted. The site has three associated radiocarbon dates; all relate to the second phase of the Middle period.

Table 6. Sites represented by Subtype 9P

SITE	COUNT
ISOLATES	2
SBA- 209	1
SBA- 210	5
SBA- 539	2
SBA- 552	2
SBA- 555	1
SBA- 609	1
SBA- 670	1
SBA- 710	1
SBA- 712	1
SBA- 734	1
SBA- 908	1
SBA- 931	1
SBA-1005	1
SBA-1017	1

Both specimens excavated at SBA-552 were recovered from Unit 9. This unit was also the source of five of the six radiocarbon dates taken. The deepest Subtype 9P specimen was recovered from between 80 and 100 cm below the surface. The upper most radiocarbon sample was taken from between 140 and 160 cm. This sample, as well as the others taken from the unit, refer to the earliest recorded phase of the Early period and its progenitor. One other date from the site relates to the latest phase of the Early period. In addition, beads associated with Late period occupation have been documented.

The single specimen recovered from SBA-670 is formed from tabular Monterey chert and retains a large amount of cortex on one face. It is an extremely well formed and narrow specimen. Temporal data for the site indicate two components. Three radiocarbon dates infer occupation during the first phase of the Late period. Five dates reflect deposits related to the latter half of the Early period.

The specimen recovered from SBA-931 is an excellent example of the subtype, all dimensions and workmanship reflect the mean. Length measures 55 mm; width to length ratio is 0.61. It is made from flake of Monterey chert and exhibits pronounced barbs. It is, however, much thinner than the average subtype specimen. Workmanship is good, with the majority of the mass being removed from the dorsal surface.. It is comparable to Type 9M with the exception of its pronounced stem. Temporal data from SBA-931 indicates occupation prior to the earliest recorded phase of the Early period and during the second phase of the Middle period.

Subtype 9P would be comparable to Greenwood's (1972:16) Type 6a. Discussions of distribution, temporal assignment, and cultural relationships have been addressed during the analysis of Subtype 9A of the current analysis. The reader is referred to this section for information concerning all Subtype 9P comparisons.

#### SUBTYPE 9Q

Subtype 9Q is represented by a single specimen. If not for its exotic material, obsidian, and analogous examples outside the area, this specimen would have been described as a variant of Subtype 9S. The subtype is defined as Type 9 points whose proximal shoulder angle is greater than, or equal to,  $65^{\circ}$  and whose distal shoulder angle is greater than, or equal to,  $205^{\circ}$ . In addition, the base is indented.

The specimen was recovered from between 140 and 160 cm below the surface at SBA-552. A radiocarbon sample from this unit/level returned a date of  $3630 \pm 200$  B.P. This relates to the latest phase of the Early period. It is the most recent date returned, with all other dates relating to the earliest recorded phase of the Early period and earlier.

The only available south coast reference to this subtype comes from Harrington's (1933) report on Gypsum Cave. He illustrates a Gypsum Cave point from San Nicolas Island. The specimen is made from obsidian and was grooved above the shoulders, apparently to facilitate suspension from a cord (1933:117, Figure 53c). The specimen was found by M. Rogers "... in a Shoshonean cremation on top of a Canalino midden ..." (1933:117).

Harrington (1933:117) believes the piece was curated. The fact that both of these specimens are made of obsidian is provocative in that this material must have come from sources in eastern California. Harrington's association was, at least in part, stimulated by

the specimen illustrated (Harrington 1933: Figure 19). Further discussion of Gypsum Cave point types can be found with reference to Subtype 9M of this study.

Wedel (1941:64) recovered three similar specimens from Site 1 (KER-39) at Buena Vista Lake. Two of the specimens were classified as Type SBc, while the third was classified as Type SAa (after Strong 1935). One of the Type SBc specimens was recovered from between two and three feet below the surface, while the other was from between five and six feet. The SAa specimen was made of quartz porphyry (Wedel 1941:64, Plate 38z). Both Early and Late period occupation is acknowledged for the site.

#### SUBTYPE 9S

Subtype 9S is defined as Type 9 points whose proximal shoulder angle is between 90° and 65° and whose distal shoulder angle is greater than, or equal to, 205°. In addition, its base must be either straight or convex. The necessity for this requisite is due to the singular occurrence of a point fragment exhibiting all the metric requirements of Subtype 9S, but having a distinctive basal indentation (see Subtype 9Q).

Thirty-two specimens qualify as Subtype 9S. Ten sites are represented: SBA-209, 210, 539, 552, 670, 734, 740, 745, 1010, and 1019. Weight index range from 300 to 2916; these represent 2.1 and 20.4 g, respectively. Analysis of the weight index variable has inferred three modes with breaks at approximately 400 and 2400. These represent weights of 2.8 and 16.8 grams.

The lightest group contains only one specimen and was most likely used as an arrow point. It is made from Franciscan chert. The heaviest specimens could function equally as well for knives or spear points. However, roughness of finish indicates the former. All of these specimens are made from Monterey chert. The central group is made up of points that would have served as dart tips. The marginal specimens could have served two functions equally well. The majority are made from Monterey chert; however, Franciscan and Temblor Range cherts are also represented.

Six of the ten sites represented have associated radiocarbon dates. These dates infer that three sites, SBA-209, 539, and 1010, are single component. SBA-209 is dated to the earliest recorded phase of the Early period. SBA-539 and 1010 are dated to the second phase of the Middle period.

The two specimens from SBA-209 are morphologically similar to one another. One is a member of the middle range group and the other belongs to the larger group. Both are made from high quality Monterey chert and have projections at the shoulder. This feature is noted by Greenwood for here Type 4b points (weakly shouldered, transitional between stem and leaf) and Type 1a blades (leaf shape, rounded or tapered base) (Greenwood 1972:16,19).

SBA-539 has three specimens: two medium size points, and one large knife. All three specimens are made from Monterey chert. The two medium specimens represent the lower end of the range (5.7 and 7.5 g. estimated weight). Both would function well as arrow points; both have well developed shoulders. The large specimen includes the projection observed on the SBA-209 specimens.

The single Subtype 9S specimen recovered from SBA-1010 is distinct and could be judged to be a separate subtype. It is made from a granular form of dark green, banded obsidian. Shoulders are arched and taper to a narrow, but well developed stem.

Radiocarbon and bead data from SBA-210, 552, and 670 indicate these sites are multicomponent. SBA-552 and 670 are composed of components related to the Early and Late periods. Evidence for Late period occupation at SBA-552 is limited to preliminary bead analysis. These Late period beads possibly relate to the protohistoric occupation at SBA-210, and does not necessarily indicate full scale occupation of the site during this period.

Two specimens are present from SBA-552: one medium size and one large. The medium point is made from grey/green Franciscan chert and is discolored over much of its surface. The piece retains evidence of the original flake detachment scar and reduction techniques have left a rather sinuous edge. The large specimen is made from Monterey chert and bears the lateral projections previously described in the sample.

Fourteen specimens were recovered from SBA-210: 12 Monterey chert and two unidentified cherts. Both of specimens made from unfamiliar chert are from similar, if not identical sources. The chert variety consists of tight black and white bands, but appears quite homogeneous, that is, without cleavage associated with the bands.

Only mid-range points are represented in the SBA-210 collection. These extend from the lower to the upper limits of the range. Morphologically they range from points with distinctive shoulders to those with shoulders that were barely discernible. Workmanship is unimpressive overall, with smaller forms considerably more refined. One of the larger specimens within the group contains the familiar lateral protrusion.

Two noteworthy variations were recovered from SBA-210 and 754. These two specimens possess distinctly straight, well formed bases. Both are made from Monterey chert. The SBA-754 example has much finer workmanship than the SBA-210 specimen. The SBA-754 specimen is the smaller of the two and size would limit its usefulness to a dart point. The larger, more crude specimen would serve well as a knife.

Comparison with Glenn's (n.d.) classification is restricted due to the reorganization of the subtype and Type 9 in general. Many points now designated as Subtype 9S were classified differently by Glenn (n.d.). Those previously classified as Subtype 9S and its smaller counterpart 9R have, for the most part, been included in the current Subtype 9S. Therefore, discussion of temporal data concerning Glenn's Subtype 9R and 9S is relevant to the current analysis.

Glenn identified five sites containing Subtype 9R points and had associated temporal data: SBA-167, 210, 574, 585, and SLO-178. Of these, three were dated exclusively to the Late period: SBA-167, 574, and SLO-178. The remaining two sites also contained a Late period component.

Glenn's Subtype 9S was represented at SBA-60, 210, 552, 574, 585, and 740. Of these, all but SBA-740 had associated temporal data. SBA-60 and 574 are both associated exclusively with the Late period. The remainder of the sites contain a Late period component. Glenn (n.d.:41) assigns both these subtypes to the Late period.

Greenwood's (1972) classification scheme bisects Subtype 9S of the current study. Many of the Subtype 9S specimens would have been incorporated into her Type 6a (triangular blade with broad, long contracting stem), while others would be classified as

Type 4b (weakly shouldered, transitional between leaf and stemmed). Larger specimens would have been assigned to Type 1a of the blade category. Distribution of her Type 6a has been discussed as it relates to Subtype 9A of the current study. Most Type 4b points of the Greenwood study are reported to occur in the upper levels of site one (1972:16). These levels are associated with Chumash period occupation. Type 4b points are reported from sites 2, and 7. However, these data lack exact provenience (Greenwood 1972:52, 72).

Research outside the area has done little to elucidate spatial and temporal distribution of the subtype. This may indicate the paucity of the subtype in the southern California region. Evidence for the distribution of the subtype in the Central and San Joaquin Valleys was more apparent.

Wedel (1941:64, 99, Table 8) recorded the occurrence of six Type SBc points during his work at Buena Vista Lake (types after Strong 1935). The two specimens recovered from Site 1 (KER-39) are reported to have basal indentations and would, therefore, be classified as Subtype 9Q in this analysis. The four remaining SBc points were recovered from Site 2 (KER-60). Three of the specimens are associated with the upper 60 cm of the deposit; the fourth specimen lacks exact provenience. The upper levels at both sites are associated with Late period occupation in the San Joaquin Valley. However, the Early period component can not be ignored.

Heizer's (1949) work in the Delta region of the Central Valley recovered a number of specimens comparable with Subtype 9S. Heizer (1949:21) lists only one Type SBc point being recovered. He does list 30 Type SAa points (after Strong 1935). Heizer notes the obvious restrictions of Strong's typology and suggests that intermediate specimens are "arbitrarily disposed of by assigning them to one or another shape group" (Heizer 1949:20). In doing so, many specimens comparable to Subtype 9S have been assigned to the Type SAa category.

The majority of the specimens assigned to Type SAa have straight base stems. All four of his test sites were represented by this type. All were believed by Heizer to be exclusively Early Horizon manifestations. However, the occurrence of a number of flexed burials indicate a possible Middle Horizon component for many of the sites.

## SUMMARY OF INTER/INTRA-REGIONAL CORRELATIONS

The descriptive text above has provided substantial documentation of morphological similarities between the specimens recovered from Vandenberg Air Force Base and projectile points and bifaces from the surrounding regions. Comparisons also provide strong temporal correlations between morphological forms encountered in the sample and those from the various regions of California and the Great Basin. A summary of these correlations and problems perceived during analysis is in order.

### POST-DEPOSITIONAL PROCESSES AND STRATIGRAPHIC INTERPRETATION

The two most prohibitive aspects of the analysis were the determination of temporal placement of the sites represented by specimens in the sample and the reliability of associative context. Two forms of temporal indicators are heavily relied upon in California: radiocarbon dates and shell bead seriation. A number of sites with specimens in the sample had no radiocarbon dates available, while other sites had a single date usually

representing the basal level of the site. Bead data was, in general, unavailable for this analysis. The exception was the identification of exotic glass beads associated with European contact.

Radiocarbon dates and beads were available from numerous sites represented by specimens. However, the availability of temporal indicators does not insure chronological control. Two factors contributed to a lack of confidence in temporal assignments among dated sites and correlations with associated artifacts: depositional processes resulting from long-term or multiple occupations and bioturbation.

Both ethnographic and archaeological studies have indicated the transient intrasite placement of residential structures and special use areas. Many of these areas undergo numerous earth moving activities, e.g., house depressions, roasting pits, hearths, and burials. Sites with one or more occupational hiatuses often contain overlapping, though not completely superimposed, deposits. This factor, along with differential deposit depth for any given period, further impairs the accuracy of stratigraphic interpretation. Preliminary interpretation of data from SBA-210 indicates these depositional processes were a part of the Vandenberg sample.

Interpretation of strata and artifact association in California is severely hampered by faunalurbation. The greatest portion of this form of disturbance can be attributed to California Ground Squirrels (*Otospermophilus beecheyi*) and Pocket Gophers (*Thomomys bottae*). Ground Squirrels, Pocket Gophers, and other burrowing animals are attracted to midden deposits by the loose, well drained soil, numerous stone and bone constituents, and the availability of plants favoring similar matrices. Recent studies have indicated that a family of California Ground Squirrels is capable burrowing through an entire site within a few years (Erlandson 1984; Johnson 1989). This results in the lateral and upward movement of small artifacts, e.g., carbon, beads and projectile points, whereas, large artifacts, e.g., manos, metates, bowls, mortars, tend to settle to the hardpan.

#### CHRONOLOGICAL ASSIGNMENTS

Both post-depositional processes and the lack of bead interpretation have hampered chronological assignment of specimens represented in the sample. Analysis has therefore relied on multiple occurrence of point types at several sites represented in the sample as well as examples of comparable specimens identified from other southern California coast regional studies (c.f. Greenwood 1972; Glenn n.d.). Point data from the southern California desert and the Great Basin has provided the principal source of morphological and temporal comparisons outside the region. Type designations are presented in terms of Great Basin point types and other established projectile points series where applicable (Table 7, Figure 7). Great Basin point types are well documented, both morphologically and chronologically, in the archaeological literature (c.f. Heizer and Hester 1978). Point types are presented chronologically, from the most recent to the oldest forms.

#### COTTONWOOD SERIES (LANNING 1963) (SUBTYPES 1B, 1E, 2B, 2C, 2E, 2G, 3C, 4A, 4B, 6A)

Heizer and Hester (1978) synthesized data regarding the occurrence of the Cottonwood Series in the Great Basin. Their summary is presented below and augmented by further discussion relative to areas in California.

Table 7. Typological correlations.

Cottonwood Series  
(post-A.D. 1300)  
(Subtypes 1B, 1E, 2B, 2C, 2E, 2G, 3C, 4A, 4B, 6A)

Rose Spring/Eastgate Series  
(A.D. 700 - A.D. 1300)  
(Subtype 8L)

Weak Shouldered/Contracting Stem  
(post-A.D. 1150)  
(Subtype 9S)

Humbolt Series  
(ca. 3000 B.C. - A.D. 700)  
(Subtypes 2I, 7D)

Contracting Stem  
(post 1500 B.C.)  
(Subtypes 9A, 9M, 9P, 9Q)

Elko Series  
(1300 B.C. - A.D. 700)  
Elko Contracting Stem  
(Subtypes 9A, 9P)

Gypsum Cave Type  
(3000 B.C. - 1300 B.C.)  
(Subtype 9M)

Gatecliff Series  
(3000 B.C. - 1300 B.C.)  
Gatecliff Contracting Stem (Elko, Gypsum Cave)  
(Subtypes 9A, 9M, 9P, 9Q)

Expanding Stem  
(Subtypes 8A, 8E, 8I, 8J, 8M, 8N, 8O)

Gatecliff Split Stem  
(300 B.C. - 1300 B.C.)  
(Subtype 8O)

Elko Series  
(1300 B.C. - A.D. 700)  
Elko Corner Notched and Side Notched  
(Subtypes 8A, 8E, 8I, 8J, 8M, 8N)

Borax Lake/Encinitas  
(3000 B.C. - 500 B.C.)  
(Subtypes 2H, 2J)

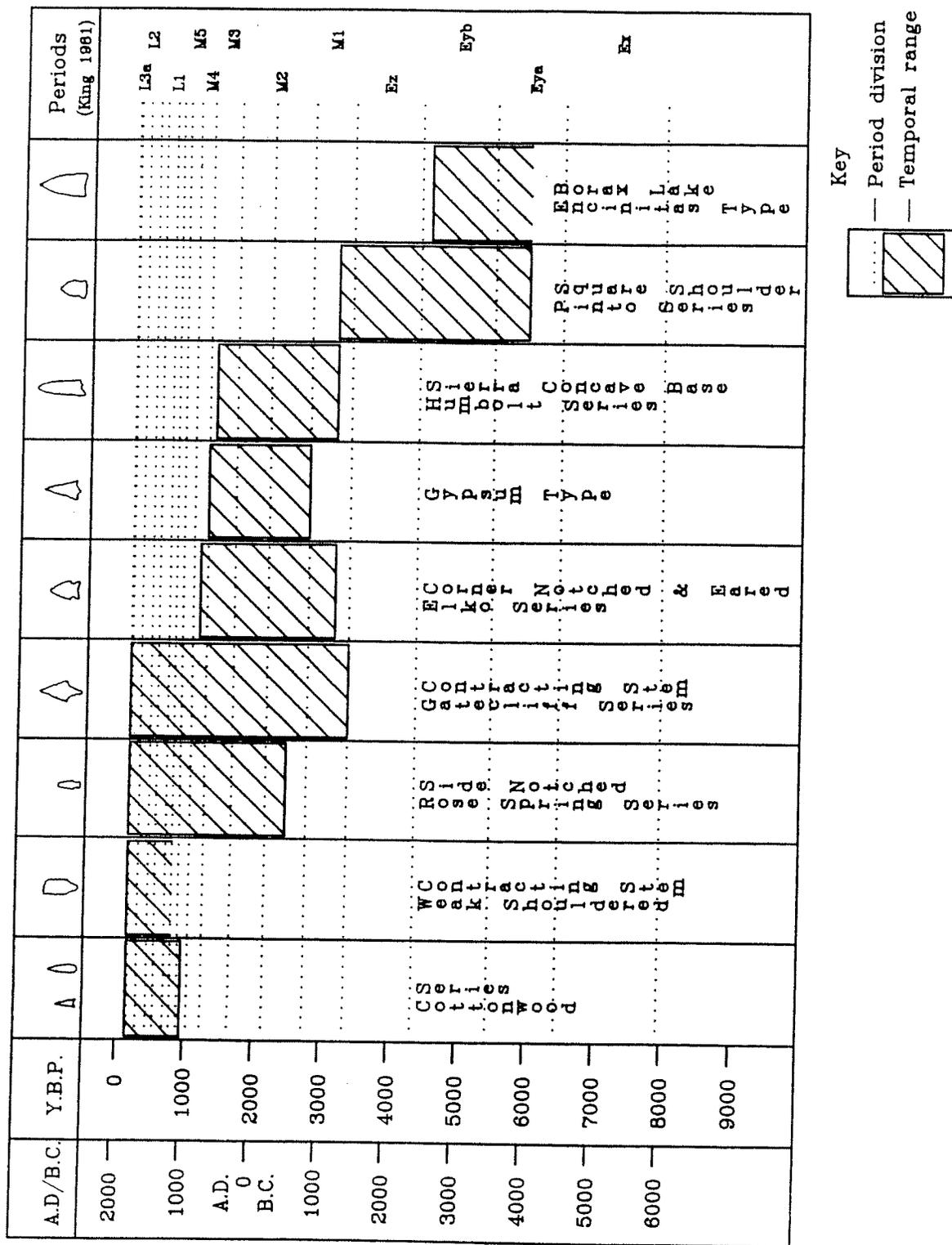


Figure 7: Postulated temporal distribution of Vandenberg projectile points.

The Cottonwood Series was originally proposed by Lanning (1963) in his analysis of projectile points from the Rose Spring site. He recognized two varieties: Cottonwood Triangular and Cottonwood Leaf-shaped. A third variety, Cottonwood Bipointed, was later described by Heizer and Clewlow (1968). These small arrow points are common in late prehistoric and historic times in the Great Basin ... In many instances, Cottonwood points co-occur with specimens of the Desert Side Notched series. ... There are five radiocarbon dates which can be applied to the Cottonwood series: [Heizer and Hester 1978:11-12]

These dates suggest that the series may have begun prior to ca. 1300 A.D., the date indicated by Lanning (1963) for its origin. Cottonwood Triangular points are thought to be representative of the tentative "Marana" period of southern California (A.D. 1300 to historic; Bettinger and Taylor 1974:20).

Association between the Cottonwood series and the Desert Side Notched (DSN) series is indicated above. This association does not appear to carry through to the historic Chumash region. Occurrences of DSN points north, east, and south of the region could be interpreted as indicative of an autonomous Chumash region (Hoover and Sawyer 1977; Wedel 1941; True and Waugh 1981). This hypothesis is further evinced by the relative dearth of obsidian imports from the desert region of southern California during the Late period relative to the Shoshonean groups of the same time period.

The time depth of the Cottonwood series is problematic. However, it is suggested here that the introduction of the series was coeval with that of the bow and arrow to the Chumash region. Analysis of point weight, and other indicators of size, reflects a shift to smaller, lighter point types during the Late period. No earlier point type in the sample, or from elsewhere in the Chumash region, represents a size serviceable as a arrow point. The exception in the sample is a single Subtype 8L specimen.

In summary, subtypes 1B, 1E, 2B, 2C, 2E, 2G, 3C, 4A, 4B, and 6A fit well into the morphological descriptions of the Cottonwood series. Dates available for the series and those applicable to the Chumash region indicate survival of the series into the historic period. Introductory dates for the series are problematic. However, a reasonable window of first occurrence is between A.D. 1000 and A.D. 1350. Further research will undoubtedly narrow, and possibly alter, this estimate.

WEAK SHOULDERED/CONTRACTING STEM  
(SUBTYPE 9S)

Few references present specimens comparable to subtype 9S outside the Chumash sphere. The subtype does appear to be common among Late period Chumash sites (c.f. Glenn n.d.; Greenwood 1972). The Late period is proposed by King (1981) to range from circa A.D. 1150 to A.D. 1804.

Wedel (1941) records several comparable points associated with the Late period occupation in the San Joaquin Valley. Heizer (1949) also recorded analogous specimens during excavations in the Sacramento Delta.

The rudimentary divisive criteria used in describing the specimens in the current sample have left an element of ambiguity with regard to regional comparisons. Taken at

face value, points termed Lake Mojave and Silver Lake (Campbell and Campbell 1937; Hunt 1960; Bettinger and Taylor 1974) would be classified as subtype 9S. Several morphologically distinctive attributes separate the desert types from those of the current study and other California point types: degree of finish and shoulder width/stem width ratio. Temporal differences are also apparent. Both desert types are associated with the Mojave period (Bettinger and Taylor 1974:8).

ROSE SPRING/EASTGATE SERIES (LANNING 1963; HEIZER AND BAUMHOFF 1961)  
ROSE SPRING SIDE-NOTCHED  
(SUBTYPE 8L)

Subtype 8L may be related to the Rose Spring Side-notched point type (Lanning 1963; Heizer and Hester 1978). Lanning (1963:268-269, 281) notes the occurrence of the Rose Spring Series from Middle Rose Spring, beginning 500 B.C., to Early Cottonwood, ending circa A.D. 1840. In the Great Basin and desert southern California, it is well established that the Rose Spring/Eastgate series is coeval with the introduction of the bow and arrow (Heizer and Hester 1978:9). It is further postulated that the Rose Spring/Eastgate series may have been developed from Elko series in response to the need for smaller points (Heizer and Baumhoff 1961; O'Connell 1971:67).

Rose Spring/Eastgate points have been identified in collections within the southern portion of Ventura county. These occurrences may be indicative of the Shoshonean influence in the area. Additional specimens are identified within the Wedel's (1941) Buena Vista Lake excavations in the San Joaquin Valley. The series is dated in the Great Basin to circa A.D. 500 (Heizer and Hester 1978).

GATECLIFF SERIES (THOMAS 1981)  
GATECLIFF CONTRACTING STEM  
(ELKO CONTRACTING STEM, GYPSUM CAVE)  
(SUBTYPES 9A, 9M, 9P, 9Q)

Large, contracting stem points are ubiquitous in the archaeological literature of the Chumash region. Temporal data indicate a long life span for the type. The type is associated primarily with the Middle and Late periods of King's (1981) chronology. A terminal date for the type is not currently established.

Comparable specimens recovered from excavations at Buena Vista Lake, San Joaquin Valley are dated to the Late Horizon (Wedel 1941). KER-60 is dated to the protohistoric phase of the Central Valley's Late Horizon. Conflicting data appears with reference to stem points as grave goods in burials related to the Deltas Early Horizon (Wedel 1941:147). The Early Horizon association is validated through examination of excavation literature for the Delta (Heizer 1949). Comparable contracting stem points are firmly associated with Early Horizon materials in the Delta. A date of 4500 B.P. is postulated for the Delta's Early Horizon (Heizer 1949:39).

Comparisons with Great Basin projectile point types is clouded by the ongoing controversy among Great Basin archaeologists with regard to the chronology of the region and the sensitivity of certain projectile points as temporal indicators (cf. Thomas 1981). The Gatecliff series, under which contracting stem points are grouped for this summary, was introduced by Thomas (1981:22) as an clustering device incorporating several previously defined types: Elko Contracting Stem (Heizer and Baumhoff 1961), Gypsum

Cave (Harrington 1933), Pinto series (Clewlow 1967), Little Lake series (Bettinger and Taylor 1974), Silent Snake series (Layton 1970), and Bare Creek Eared (O'Connell 1971). Elko contracting stem and Gypsum Caves points make up Thomas' Gatecliff contracting stem type. Thomas posits the duration of the Gatecliff series from 3000 B.C. to 1300 B.C.. This span does not correlate with the posited Santa Barbara sequence, circa 1400 B.C. to protohistoric times.

**GYPSUM CAVE (HARRINGTON 1933)**  
(SUBTYPE 9M)

It is clear from previous discussion that points comparable to the Gypsum Cave type have been documented within the Santa Barbara region (Glenn n.d.; Greenwood 1972; Orr 1968). It is also evident that a concise definition of the type is lacking (cf. Harrington 1933; Orr 1968). For the purpose of the current analysis, the type is defined as contracting stem points with a proximal shoulder angle less than 65 degrees and a distal shoulder angle less than 170 degrees.

The definition provided by Lanning (1963:251) is completely within the range of the current analysis. Lanning's summary of findings of Gypsum Cave points indicates the type as prevalent during Early and Middle Rose Spring phases; 1500 B.C. to 500 B.C. and 500 B.C. to A.D. 500, respectively (Lanning 1963:254, 281). Lanning (1963:276) postulates Middle Rose Spring as the earliest identified contact period between the Owens Valley material and the southern California coast. Middle Rose Spring corresponds to King's (1981) phase 2a through 3 of the Middle period, circa 800 B.C. to A.D. 700.

**HUMBOLT SERIES (HEIZER AND CLEWLOW 1968)**  
HUMBOLT BASAL NOTCHED  
SIERRA CONCAVE BASE  
(SUBTYPE 2I, 7D)

The point subtypes listed here as members of the Humbolt Series are uncharacteristic of the Santa Barbara region. No comparable examples could be located within the region. The exotic nature of the type is further illustrated by the material used in the manufacture of the two specimens. Both appear to be made of obsidian. However, the granular nature of the subtype 7D specimen makes material identification problematic. The dichotomy within the typological assignment of the two specimens is a result of the location of the maximum width. The utility of this dichotomy with regard to temporal and/or functional differentiation is not clear.

The Humbolt series was first defined by Heizer and Clewlow (1968) as a result of excavations at the Humbolt lake bed site in Nevada. Of the three types described, the Humbolt basal-notched type appears most comparable to the Vandenberg specimens (Heizer and Hester 1978: Figure 1e-h). Specific reference to the basal-notched type is notably lacking within the Great Basin and California desert literature. Temporal assignment of the series is problematic. Radiocarbon dates presented by Heizer and Hester (1978:2) range from 5470 to 3050 B.P..

Morphological correlation between the Vandenberg specimens and Sierra concave base points is robust. The Sierra concave base point type is assigned to the Chowchilla phase of central Sierra Nevada, circa 2250 to 1650 B.P. and the Canebrake phase within the southern Sierras, circa 3150 to 1350 B.P. (Moratto 1984:316, 333). Both dates correlate

well with the single radiocarbon date derived from SBA-1010, the origin site of the two specimens.

LARGE SIDE-NOTCHED (THOMAS 1981)  
(SUBTYPE 8A, 8E, 8I, 8J, 8M, 8N, 8O)

The current analysis combines several morphological types under the term "expanding stem". This clustering procedure is a result of Glenn's (n.d.) previous analysis which incorporated a large number of expanding stem projectile points, the bulk of which were recovered from a single site, SBA-53. I believe that individual morphological distinctions may have utility beyond that of expedient classification, i.e., temporal or functional affinities. However, current data allow only conservative interpretation of these distinctions.

The seminal chronology of the Santa Barbara sequence was presented by David Banks Rogers (1929). Rogers attributed large side-notched points to the Hunting People, the second of three cultural groups defined (Rogers 1929:146). Later work by Norman Gabel and William Harrison dated SBA-53 to between 4500 and 5000 B.P. (Harrison and Harrison 1966). This site represents one of the few single component, Hunting People sites in the region. Numerous examples of large side-notched points have been recovered, but usually in multi-component sites.

Carter's 1941 work at Point Sal and Harrison's work in the at SBA-53 and SBA-54 place the side-notched point type at an earlier date than that of the contracting stem variety. Greenwood (1972) confirms this sequence. Carter goes further in suggesting that a side-notched variety having a bulbous base preceded the concave base variety (Carter 1941:216). This, as well as other, proposed subdivisions would necessitate controlled excavations in a matrix with superior stratigraphic integrity. Such stratigraphic integrity within the southern California region is restricted to the Channel Islands.

Excavations at Buena Vista Lake in the southern San Joaquin Valley recovered few large side-notched points in contrast to the large number of contracting stem points (Wedel 1941). These data do not provide sufficient evidence for temporal assignment of large side-notched points in the southern San Joaquin Valley. Similar restrictions are placed on data from the Sacramento Delta (Heizer 1949).

Strong morphological correlations are seen between large side-notched points of the Santa Barbara region and those of the inland desert of California and adjacent Great Basin. The Elko series, Amargosa and Pinto points are especially pertinent (Heizer and Baumhoff 1961; Rogers 1939; Campbell and Campbell 1935).

The Large side-notched classification used by Thomas (1981:18-19) incorporates several previously defined Great Basin point types: Northern Side-notched, Madeline Dunes Side-notched, Elko Side-notched, and Rose Spring Side-notched. In doing so, Thomas (1981:30) points out that the typological distinctions between the types are "weak and confusing". Thomas (1981:18) designates these types as pre-A.D. 1300.

**PINTO SERIES (CAMPBELL AND CAMPBELL 1935)**

**PINTO SQUARE SHOULDER (HARRINGTON 1957; HEIZER AND CLEWLOW 1968)**  
**(SUBTYPE 8O)**

Warren (1968:2-6) postulates an intrusion of Pinto tradition, desert peoples to the Santa Barbara region, circa 3000 B.C.. Warren designates this occurrence the Campbell Intrusion with the resulting cultural group analogous to Rogers' (1929) Hunting People. The Pinto Tradition itself is not clearly understood (Heizer and Hester 1978:3-5). Bettinger and Taylor (1974:13) place Pinto points within their Little Lake period. The temporal span for the period is postulated at 4000 to 1200 B.C., well within the range of Warren's Campbell Intrusion.

**ELKO SERIES (HEIZER AND BAUMHOFF 1961, THOMAS 1981)**

**ELKO CORNER-NOTCHED, ELKO EARED**  
**(SUBTYPE 8A, 8E, 8I, 8J, 8M, 8N)**

Thomas' (1981) divisive criteria for differentiating notched point types was more objective than Glenn's (n.d.) study of Santa Barbara projectile points. This was, in part, due to the emphasis on different morphological attributes. This resulted in some subtypes of the current study being split according to Thomas' (1981) criteria. Suffice it to say that several specimens in the Vandenberg sample closely approximate Elko point types.

A great deal of controversy surrounds the utility of Elko corner-notched and Elko eared points as time markers in the Great Basin (Aikens 1970; Heizer and Hester 1978:7). Aikens' (1970:51) excavations at Hogup Cave indicate the introduction of the series circa 6000 B.C. with a terminal date for Elko corner-notched at A.D. 1350.

Temporal span of the series in the southern California desert is more restricted than that of the Great Basin. Bettinger and Taylor (1974:14-19) include Elko series points in their Newberry period, circa 1200 B.C. to A.D. 600. In doing so, they incorporate Amargosa points of the Mojave Desert into the Elko series (Harrington 1933; Lanning 1963).

**BORAX LAKE/ENCINTAS (HARRINGTON 1948, WARREN 1968)**  
**SUBTYPE 2H, 2J**

The strongest morphological correlations for the subtype are found in sites dating to the Early period or perhaps the Paleo-indian era. The single published reference to the type within the southern California coastal region is by Treganza and Malamud (1950) reporting on excavations at the Tank Site (LAN-1). The early component of the Tank Site is dated to "earlier than 3000 B.C. (Johnson 1966). Other examples have been noted by the author in collections from Rincon (SBA-1) and San Nicolas Island.

Additional references within California are noted from the Borax Lake excavations (Harrington 1948) and the Sacramento Delta (Heizer 1949). Fredrickson (1973) recognizes three cultural components ranging from 12,000 to 3000 B.P.. Specimens comparable to those within the Vandenberg sample are assigned to the Mendicino Aspect of the late Borax Lake Complex, circa 5000-2500 B.P. (Fredrickson 1984:522). Comparable Delta region points are assigned by Heizer (1949) to that regions Early Horizon, circa 4500 B.P..

LARGE LEAF, RHOMBOID, AND BIPOINTED  
SUBTYPE 4C, 4D, 4E, 5A, 5B, 5C, 6B, 6C

Discussion of temporal correlations of large leaf, rhomboid, and bipoined specimens in the Vandenberg sample and comparable specimens within and outside the Santa Barbara region provides little useful information. Analysis of the Vandenberg specimens indicates a long duration and wide spatial distribution for these morphological forms. Examples of rough points, knives, and blades in the archaeological literature of regions used for comparison during this analysis substantiate this inference (M. Rogers 1939; Harrington 1948, 1957; Treganza and Bierman 1958; Warren and True 1961; Wallace 1954; Jones 1956; Heizer 1949).

## CONCLUSIONS

Discrimination of morphological characteristics of projectile points through attribute analysis has identified 37 discrete categories within specimens recovered during excavations on Vandenberg Air Force Base (Table 3). Divisive attributes were predominantly measurements of size and haft morphology (Table 2). Assessment of spatial distribution within the Vandenberg sample, the Santa Barbara region, and adjacent regions has demonstrated the continuity of several morphological forms across cultural, linguistic, and physiographic boundaries. In addition, strong temporal correlations have been established among morphological forms.

The current analysis represents a sequence beginning prior to 3000 B.C. with the Encinitas Tradition (Johnson 1966; Warren 1968). This tradition is represented in the sample by large, triangular, concave base points. The paucity of this form within the sample can be cautiously interpreted. It may be representative of a relatively small population often postulated for this time period. Alternatively, it may be indicative of the rarity of projectile points within the Encinitas Tradition.

The next major shift in projectile point morphology is seen with the introduction of large, side-notched points variously referred to as Elko, Amargosa, Northern Side-notched, and others. It is postulated here, as by Warren (1968), that this point form is associated with the intrusive Campbell Tradition. Temporally sensitive subdivisions within the Campbell point morphology have been postulated (Carter 1941). Current data can not confirm or reject these interpretations. The Campbell Tradition and its various point forms is believed to have first arrived in the Santa Barbara region circa 3000 B.C. (Harrison and Harrison 1966, Warren 1968). The relationship to the earlier Encinitas Tradition is poorly understood. Harrison postulates a transitional "Extranos period" (Harrison and Harrison 1966).

The terminal date for Campbell Tradition points is unclear. It is, in all probability, contemporaneous with the arrival and/or development of what has variously been termed the Canalino or Chumash culture. The continuity, or the lack thereof, of the Chumash culture in the Santa Barbara region is beyond the scope of this paper. Suffice it to say that the introduction of the large, contracting stem projectile points in circa 1400 B.C. is a likely manifestation of this culture's adaptation. This date is derived from King's (1981) interpretation of a major shift in burial good types, especially beads, at this time.

Interpretation of morphological variation within the contracting stem type is the weakest element of the current analysis. The variation and longevity within the form

indicates evolution on the one hand and continuity on the other. As with Campbell Tradition points, the terminal date of contracting stem varieties is uncertain. Current perception connotes a continuous use of the type into historic times. The Chumash dependence upon sea mammals during the Middle and Late periods supports the necessity for harpoon heads, possibly in the form of contracting stem points.

The introduction of the bow and arrow to the Santa Barbara region undoubtedly brought with it a need for the reduction in the size of projectile points. The Rose Spring side-notch point identified in the Vandenberg sample was a plausible option. The paucity of this form within the sample and the exotic material of manufacture can be variously interpreted. However, given the increase in examples to the south and their prevalence in the western Great Basin, circa 500 B.C., it is likely that the form was more closely associated with the Shoshonean intrusion into the areas now defined as Ventura, Los Angeles, and Orange Counties.

The last, well defined, projectile point form represented in the Vandenberg sample is the Cottonwood Series. All three varieties: triangular, leaf, and bipointed, are represented. Use of points within this series as arrow points is well documented. Current data indicate the series is associated exclusively with Santa Barbara's Late period, circa A.D. 1150 into the historic period. Lanning (1963:269) posited more exacting temporal associations for types within the Cottonwood Series with Cottonwood Triangular points preceding Cottonwood Leaf-shaped by several hundred years. Data currently available for the Santa Barbara region do not allow testing of this hypothesis. The association of Cottonwood Series points with Desert Side-notched points in the Owens Valley does not follow through to the Santa Barbara region. The association is stronger along the perimeter of the Chumash territory.

The morphological similarities of specimens represented in the sample to those previously identified in local and adjacent regions, especially the Great Basin, has allowed assignment of the greater portion of the defined morphological forms to temporally sensitive series (Table 7, Figure 7). In doing so, it is evident that the Vandenberg sample is representative of virtually the entire sequence of human occupation of the region. The exception is the lack of artifactual constituents associated with the Paleo-Coastal Tradition. This component within the Santa Barbara region is, in general, poorly represented (Moratto 1984:104).

I believe refinement of the typology presented is both necessary and plausible. As with most studies within archaeology, the current analysis generates as many questions as it answers. The Vandenberg sample has by no means exhausted its usefulness with regard to typological analysis. Logistical restrictions have limited the analysis to projectile points alone. Temporally diagnostic artifacts, especially shell beads and ornaments, were not studied to any degree, thus limiting the temporal correlations. These data would be especially useful with regard to Type 9 subtype evaluation. Analysis of lithic material was recorded, but not addressed to any degree. Sourcing and hydration of obsidian specimens, as well as simple type/material correlations, would surely add data useful in trade and exchange studies and possible suggestions of prehistoric migration. Analysis of microwear, along with identification of associated faunal materials, would elucidate past subsistence activities. In addition, numerous techniques of morphological analysis have not been addressed.



Projects of the magnitude of the Vandenberg excavations are seldom realized. Each specific analysis adds valuable details to the overall picture of prehistoric existence on the California coast. Although limited in its scope, the analysis of Vandenberg projectile points provides the regional and temporal perspective entirely necessary to the understanding of southern California prehistory.

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Appendix A: Definitions of elements, subelements, terms, variables, and variable values.

Angular maximum width: Area of the maximum width on stemmed points is represented by a sharply defined vertex.

Base element: The base element is the edge between the two points that serve to mark the transition between the proximal transverse edge and the lateral longitudinal edges of the projectile point (Binford 1963:197).

Concave base: Defined as the edge which describes a concave line between the two defining points of the base. (Adapted from Binford 1963:208).

Convex base: Defined as an edge which describes a convex line between the two defining points of the base. (Adapted from Binford 1963:208).

Straight base: Defined as an edge which describes a straight line between the two defining points of the base (Binford 1963:207).

Pointed base (Binford's bivectoral): Defined as the proximal segment of a tang which is described by two lateral edges and a line drawn across the point from the proximal points of juncture of the haft element (Binford 1963:208).

Rounded base (Binford's convex): Defined as an edge which describes a convex line between the two defining points of the base. (Adapted from Binford 1963:208).

Class: A group of specimens with prescribed morphological similarities.

Contracting stem: A point's stem element whose proximal shoulder angle is less than 90 degrees.

Distal shoulder angle (DSA): The Distal shoulder angle is the angle formed between the line (A) defined by the perpendicular to the longitudinal axis (C) at the intersection of A and C. DSA ranges between 90 degrees and 270 degrees. If points are asymmetrical, the smaller value of the DSA is measured, DSA is recorded to the nearest five degrees (Thomas 1981:11).

Element: Elements are those morphologically differentiated edges or areas of the projectile points that are definable in terms of points of juncture (Binford 1963:197).

Group: An aggregate of specimens without defined variable values.

Length: Measured parallel to the axis; the distance between the proximal and distal extremes. Measured in millimeters.

Notch opening index (NOI): Calculated as distal shoulder angle minus proximal shoulder angle.

Proximal shoulder angle (PSA): The Proximal shoulder angle is that angle formed between the line (D) defined by the proximal point of juncture and line (B) plotted perpendicular to the longitudinal axis at the intersection of C and D. PSA ranges between 0 and [180] degrees. If points are asymmetrical, the smaller value is measured. PSA is measured to the nearest five degrees (Thomas 1981:11).

Serration: The deliberate flaking of the blade edge resulting in a saw like edge.

Shoulder: A point is termed shouldered if DSA and PSA can be measured.

Stem:

Non-shouldered points: That portion of the point proximal to the maximum width.

Shouldered: That portion of the point proximal to the vertex of the shoulder angles.

Type: Temporally sensitive class of specimens.

Weight index: Calculated as length multiplied by width.

Width (maximum): The greatest distance, measured parallel to the baseline, between any two points on the artifact (Ahler 1971:22). Maximum width is measured in millimeters.

Width/length ratio (wlratio): Calculated as width divided by length.