Archaeological Excavation at the Village of Pa'Mu, Ramona Valley, California

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The Kumeyaay village of Pamo appears in ethnographic literature and in early Spanish documents. Archaeological excavation and analysis at Pa'mu in the Ramona Valley of San Diego have provided documentation of this important village. This paper will examine the structure of a Late Prehistoric village, discuss recent developments in sourcing Tizon Brwon Ware, address issues of the prehistoric environment and plant use, describe the results of pollen and blood serum analyses, and place the village in the context of inland Late Prehistoric sites.

The Kumeyaay Village of Pamo (Pa'mu) appears in the ethnographic literature and in early Spanish documents. Archaeological excavation and analysis during the Oak Country Estates development project in the Ramona Valley of San Diego have provided documentation of this important village. This paper presents the results of archaeological investigations and examines the structure of a Late Prehistoric village, addresses issues of the prehistoric environment and plant use, presents the results of special studies, and places the village in the context of inland Late prehistoric sites in the San Diego County area.

The Oak Country Estates project property lies within the Santa Maria Valley, also referred to as the Ramona Valley, located along the western foothills of the Laguna Mountains of the western peninsular ranges of San Diego County (Figure 1). Santa Maria Creek, which flows through the property, originates in these mountains and combines with Santa Ysabel Creek in San Pasqual Valley, 3.2 kilometers to the northwest of the property, to form the San Dieguito River. Natural vegetation on the property consists principally of dense coast live oak woodland, open coast live oak woodland, disturbed coast live oak woodland, southern willow scrub, buckwheat scrub, southern mixed chaparral, mule fat scrub, freshwater seeps, non-native grassland, and San Diego clay pan vernal pools (Nordby and Robbins 2003). Clusters of large Coast Live Oaks and Englemann Oaks are present, amidst numerous large granitic bedrock outcrops, in the central areas of the property with open grasslands present in the southern areas. Sometimes dense chaparral and sage scrub vegetation is present mostly in the northwestern areas of the property.

A field survey and subsurface testing program, performed by Mooney & Associates for the Oak Country Estates project, identified 30 previously recorded, and ten newly discovered prehistoric sites within the 769-acre project. During the testing program, 427 STPs and 35, 1 by 1 m units were excavated. Based on the results of site boundary testing, 12 of the previously recorded 30 sites were combined to form four sites, resulting in a revised total, including 10 newly discovered sites, of 32 prehistoric sites. The boundary testing program also determined that 17 sites had subsurface deposits, suggesting that the sites consisted, either of more substantial habitation locations with associated milling features, or of milling stations with associated temporary campsites or smaller habitation areas. The test results also indicated that 15 of the 32 sites did not have subsurface deposits present consisting only of surface artifacts and/or bedrock milling features.

Together, the 32 sites contained 350 bedrock features including 1,317 slicks, 243 basins, and 58 mortars, and produced 172 flaked stone tools and cores with 9,115 pieces of debitage, 255 ground stone tools, 16 pieces of modified bone, 255 prehistoric ceramic sherds, 14,846 pieces of faunal bone and 18 pieces of shellfish shell. Also recorded were six rock rooms and three other surface rock features. Analysis of the initial STP test results indicated that the artifact assemblages at the 32 sites were primarily Late Prehistoric and their distribution resembled a hypothesized settlement pattern of a dispersed village settlement. The hypothesized pattern consists of several sites forming the central habitation area of the village and other less extensive sites comprising dispersed loci of resource procurement and/or processing activity,

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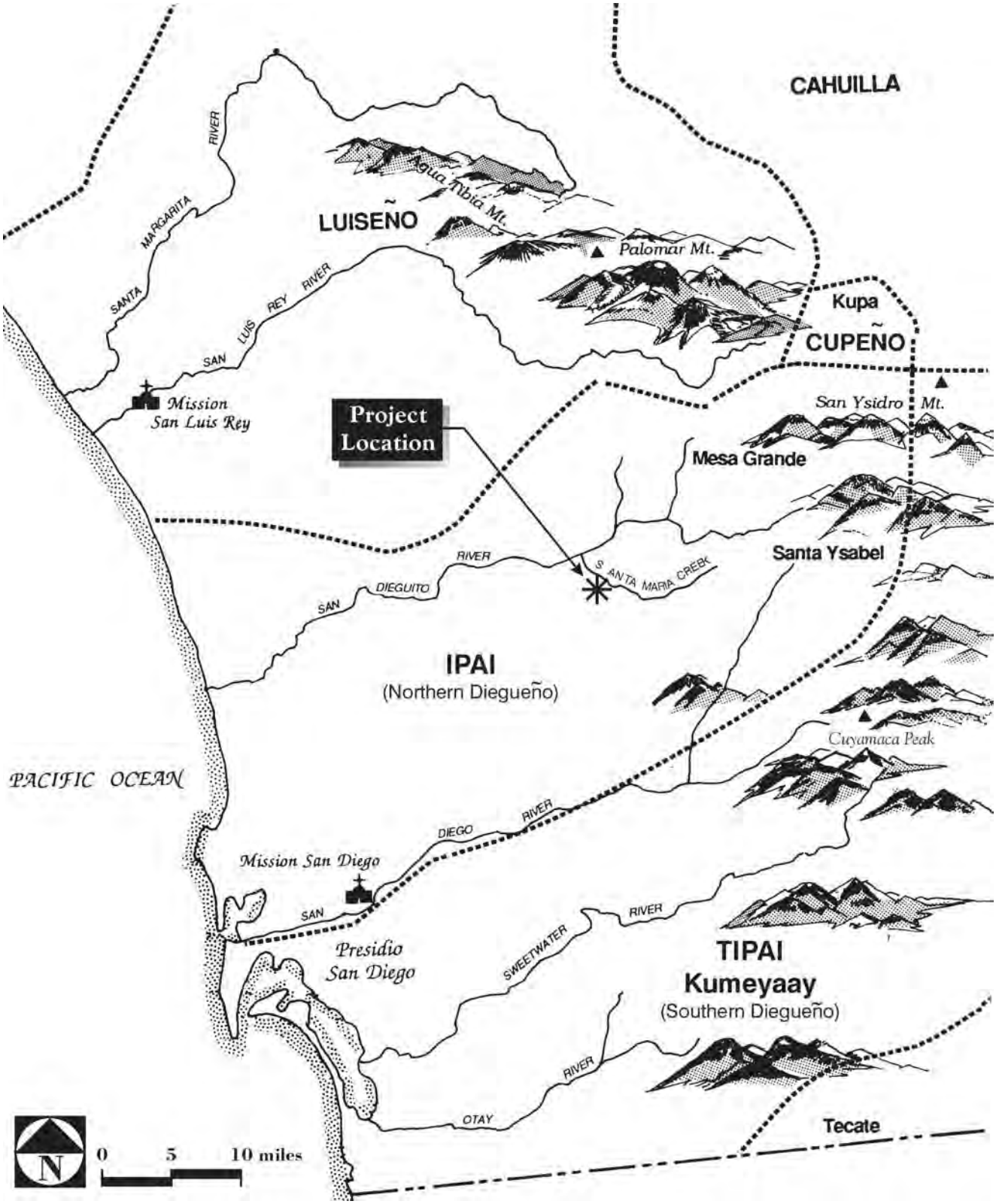

Figure 1: Location and ethnographic map.

which may have included temporary habitation away from the main village area.

Research Design

The research approach proposed for the significance testing and evaluation program of the 32 sites was, both general and particular. In general, it was hypothesized that the sites represented a dispersed village settlement pattern with several discrete, but proximate site loci, forming the central habitation area of the village and other less extensive sites comprising dispersed loci of activity and/or temporary habitation areas situated farther away from the main village area (Carrico 2003; Carrico and Cooley 2003). Based on ethnohistoric research and these test results, it was proposed that the Oak Country sites may represent a significant portion of the rancheria or village of Pa'mu, a settlement constituting one end of a bipolar settlement system (i.e., upland and lowland winter and summer villages) inhabited by the *shrichak* clan of Mesa Grande during the winter (Carrico 2003).

With the apparently limited range of prehistoric site types or loci hypothesized in the Research Design as a dispersed village settlement, four rather broad research topic realms were formulated to aid in evaluating the research potential and, ultimately, the significance of the sites on the property. The research topic realms selected were considered to be the most relevant for the proposed research focus and the apparently limited range of site types present. The research topics were chosen to address the sites as they might function as loci within a dispersed village settlement as well as to verify their seasonal occupation and contemporaneity. In addition, related questions concerning trade and diet were addressed. Overall, the topics represented those that would be appropriate for the project region in general, while at the same time addressing the dispersed village hypothesis. Specifically these research topics involved:

1) *Site function*. If, as hypothesized, these sites represented a portion of the dispersed rancheria of Pa'mu, a settlement representing the winter/spring end of a bipolar settlement system of (i.e., of lowland winter/spring and upland summer/fall villages), then it seemed likely that materials recovered would reflect a seasonal content and an interconnectedness of both type and function. To examine this question, it was hoped that faunal and macrobotanical remains, which can be instructive as to both seasonality and site function, would be recovered.

2) *Chronology*. If these sites, indeed, represent a single village, the site assemblages should reflect contemporary occupation. To verify this, it was hoped that organic materials could be recovered during testing that would allow absolute dating and that temporally diagnostic artifacts would be recovered that would provide data for relative dating. Ethnographic and ethnohistoric accounts indicate that the village of Pa'mu was occupied extending from the Late Period well into the early 1800s (Carrico and Cooley 2003). It would be expected, therefore, that the site assemblages should reflect occupation during this time period. Dating could also potentially indicate the length of time that the sites were occupied and/or the presence of multi-time period site occupations. Evidence, in addition to Late Period materials, for this latter circumstance would be the occurrence of pre-bow and arrow projectile points and/or lithic materials such as Coso obsidian (cf. Hughes and True 1985; Laylander and Christenson 1988), or the recovery of organic materials that could produce absolute dates indicating occupation extending from the Late Prehistoric back into the Archaic. If, on the other hand, sites manifesting only evidence of Archaic occupation were found, it would indicate a site occupation that was otherwise than the hypothesized contemporaneous dispersed village occupation.

3) *Food and lithic resource procurement*. This topic realm was intended to examine the sources for food and for lithic raw materials used by the sites inhabitants. The diet of the occupants, which if local, should correspond to winter foodstuffs, unless foodstuffs were either stored or transported to the sites from elsewhere. Likewise, lithic raw materials were either procured locally and/or were brought to the valley from nearby sources, or were transported from elsewhere. To address this topic realm, the recovery and identification of faunal remains and of the lithic raw materials of stone tools and debitage was crucial. It was hypothesized that patterns of local food and lithic tool materials should contrast between the summer/fall village locations (Mesa Grande) and those of the winter/spring village locations (Carrico 2003).

4) *Patterns of trade*. This realm focused on ascertaining possible patterns of resource trade and exchange with the analysis of non-local lithic materials from the sites, such as obsidian and Piedra de Lumbre chert, and by examination of pottery types. The sourcing of obsidian, a non-local lithic material from sources such as Obsidian Butte in the Imperial Valley, Coso in east-central California, and/or from other possible sources in Baja California and Northern California, could establish possible Late Period trade routes for

the acquisition of these materials(Laylander and Christenson 1988). Piedra de Lumbre chert may have been obtained through trade from its only known source in the Camp Pendleton area in northwesternmost San Diego County (Pigniolo 1992). Pottery could also help to define local trade patterns. If, in addition to the local Tizon Brown Ware, other wares were found to be present, patterns of trade or exchange with other areas might be identified (Laylander and Christenson 1988).

Also noted, in regard to the location of this cluster of prehistoric sites, was the likely presence of a spring or springs on the property. Four fields of research, conducted for the project: historic research, botany, palynology, and faunal analysis, were used to explore this possibility. Historic maps of the area circa 1870 to 1875 (U.S. Surveyor General 1870; 1875), revealed that one, and possibly two springs, were present on the property or adjacent to it (Figure 2). A seep or spring-fed marsh environment could have significantly enhanced resource availability for prehistoric hunter/gatherers. It was hypothesized that such an environment would, likely have provided not only a more reliable source of fresh water than Santa Maria Creek, but also a possibly more reliable source of food resources such as pond turtles, and other aquatic animals such as birds and fish.

Several special laboratory studies were conducted to aid in addressing these topic realms. These studies included radiocarbon dating of organic samples to acquire absolute dates for the sites, obsidian hydration and sourcing, stone tool protein residue and pollen analyses, column sample pollen analysis, macrobotanical column sample analysis, and column heavy fraction sample analysis. Results of these studies, together with the results from the analyses of the other assemblage elements such as faunal remains and lithic technology, could provide additional context and perspective as well as specific information to better examine the dispersed village settlement hypothesis, as well as to analyze hunter-gatherer mobility and subsistence practices for comparison of both intra-site and inter-site chronological and spatial relationships in the Ramona Valley area.

RESULTS

The 9,287 flaked stone artifacts recovered from the 32 sites included 24 cores, 30 utilized/modified flakes and chunks, 13 uniface tools, 67 biface tools, 38 percussion tools, and 9,115 pieces of manufacturing debitage. Results of the flaked stone analysis indicated a diversity of use-wear and tool functions among the formal flaked stone tool types, and the utilized flakes/chunk tools demonstrated that a considerable amount of industry was carried on at the sites. The biface tools consisted of both large and small types with different functions implied by their size and morphology. Functions that were interpreted included dart and arrow points, and knives and spear points. The presence of incomplete biface fragments and debitage attributable to biface manufacture also indicated the manufacture of these tools at the sites. Hammerstones, essential for the manufacture and maintenance of both flaked stone and ground stone tools were recovered. Formal flaked stone chopping tools, scrapers and scraper planes, tools used to both procure and process materials such as wood or cane for the manufacture of shafts for arrows and spears or for the handles of knives, were also recovered from the sites. These latter tools can also be used to butcher animals and to process animal hides and sinew. Other tool types such as the biface projectile points and knives were likely primarily associated with hunting, while ground stone tools, were primarily associated with vegetal processing. Formal flaked stone tools and utilized flakes/chunks undoubtedly represented augmenting tools in the procurement and/or the processing of both of these types of resources. This combination of task diversity and intensity demonstrates the degree of habitation associated with the sites.

Additional evidence of tool function and usage was obtained from the results of the tool pollen and protein residue studies (Cummings and Puseman 2002). Three specimens tested positive for deer antiserum (likely mule deer *Odocoileus hemionus*). These results are most likely indicative of prehistoric tool use as there are few other reasons possible for the presence of this antiserum on the tools. The range of tool types with deer residues was also interesting; a chopping tool, a knife, and projectile point. While these tool functions are the current interpretations of archaeological analysts, and may not be what they were actually used for prehistorically, it still seems likely that the range of morphological characteristics does indicate different types of functions for these tools, i.e., prehistoric procurement and processing at the sites. Positive human protein residue results on five artifacts may also indicate prehistoric human tool use, or it may represent modern contamination or both. Possible plant pollens present on four manos from plants known to have been used prehistorically in the local southern California area for food or medicine, include buckwheat *(Erigonum* sp.), oak (acorns) (*Quercus* sp.), California sagebrush *(Artemisia* sp.), chamise (*Adenostoma* sp.), Indian (Mormon) tea (*Ephedra* sp.), Asteraceae (may include plant types such as aster, mulefat, tarweed, sunflower, yarrow,

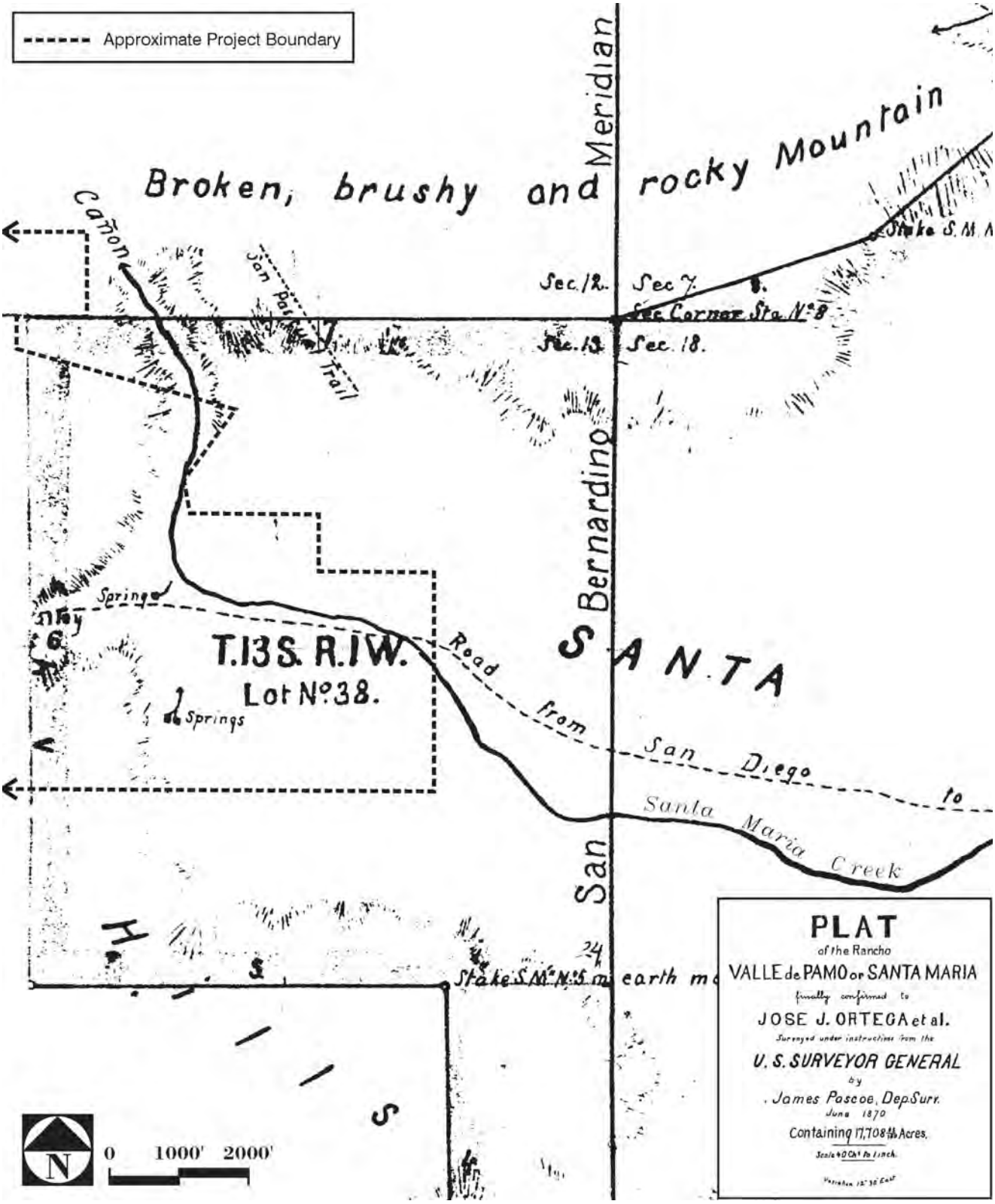

Figure 2: Springs shown on 1870 historic plat map.

broombrush, ragweed, cocklebur, and chicory), mesquite (*Prosopis* sp.), and several types of grasses (Poaceae)(Hedges and Beresford 1986). Because neither mesquite nor Mormon (Indian) tea currently are found on the property, but both are well known locally as possible food or medicine plants (cf. Anderson *et al.* 1996), they have enhanced credibility as possibly tool related. While it could not be determined with absolute certainty, that any or all of these plants were processed with the tools (i.e., ground or crushed), the presence of pollens from these plants on the tools suggests that were. These results from the tool pollen and protein residue studies indicated a range of local food procurement and processing activities that verified at least some of the diversity of prehistoric activity at the sites suggested by the artifact typological analysis.

Sources for flaked lithic raw materials at the sites were considered as a research focus. The two flaked lithic raw materials most frequently used were varieties of metavolcanics from the Santiago Peak Volcanics (SPV) Formation (50.6 %) and milky quartz (42.3 %). All of the other flaked stone materials, combined, constituted only 7.1 percent. The nearest bedrock outcrops of the SPV metavolcanics are approximately 12 kilometers to the west along the San Dieguito River Valley, exposed beginning at Lake Hodges and extending west (Weber 1963; Williams 1985). Having existed since Jurassic times, this formation has, however, contributed substantial amounts of rock in cobble form to a number of the later Cenezoic sedimentary formations present in the coastal San Diego County area. These have then been re-eroded into drainages and are now present in some drainages as secondary depositions. The amount of this material available from this secondary source, locally (in the Ramona area), however, is unknown. The source(s) of milky quartz is, along with quartzite, probably the most immediately local. Milky quartz can derive, primarily, from two possible local geologic sources: from the numerous pegmatite dikes exposed in the granitic bedrock on the property and elsewhere in the vicinity (cf. Saunders 1993), and from local sedimentary formations containing cobbles such as are present in the southern project area. Two project sites had exposed and fragmented dikes containing quartz that may have been quarried. Cobbles of milky quartz were observed to be present amongst scatters of cobbles on the surface in the southern project area. Quartzite, the third most popular flaked stone material at the project sites was also readily available as cobbles in these same cobble scatters that contained the milky quartz. Quartzite cobbles, however, were much more numerous in these cobble scatters. Metasedimentary materials, most likely from the Bedford Canyon Formation, may have been picked up, either as cobbles in the Santa Maria Creek drainage, or were procured directly from a few small outcrops present elsewhere in the Santa Maria Valley (Weber 1963).

A small but significant amount of exotic lithic materials was also recovered from several of the sites. The presence of these materials indicated non-local resource procurement either through trade or through extra-local travel. Fifty-nine pieces of obsidian were recovered, from six of the 32 sites. These materials represent 0.6 percent and Piedra de Lumbre chert 0.2 percent of the tools and debitage at the sites. It appears from sourcing and hand specimen identification that a majority of the obsidian was procured from Obsidian Butte, a source in southeastern California. The remaining pieces derived from either the Coso Volcanic Field or from Casa Diablo, both in east central California, with one piece from an unknown source (Table 1). The presence of obsidian probably indicates trade, while Piedra de Lumbre chert could indicate either trade or travel.

Results from the project investigations produced chronological data to support the presence of not only a Late Prehistoric occupation of the sites, but a late Archaic occupation as well. Four radiocarbon dates of circa 100, 500, 1,000, and 1,800 years before the present provided an indication of the maximum extent of occupation and also suggest recurrent occupations of the sites from the late Final Archaic through the Late Prehistoric and into early historic times (Table 2). Obsidian sourcing and hydration data (see Table 1)also appear to support the presence of a late Final Archaic occupation, and are consistent, therefore, with the results from the radiocarbon study. Sourcing results indicated the substantial presence of Obsidian Butte obsidian, verifying a Late Prehistoric occupation at the sites, and hydration results also appeared to suggest the presence of an older, probably Archaic occupation, based on several proposed rates for Coso obsidian(e.g., Ericson 1978; Meighan 1983; Koerper *et al.* 1986; Cleland 1989), and by a hypothesized period of trade for Casa Diablo obsidian (Hall 1984; Mone and Adams 1988). The presence of 254 pieces of Brown Ware pottery at seven of the sites (Table 3) provides additional evidence for a Late Prehistoric temporal placement (MacDonald and Eighmey 1998). Nine of the biface artifacts recovered from five of the sites were identifiable as Coastal Cottonwood Series projectile points, diagnostic types of the Late Prehistoric period (MacDonald and Eighmey 1998). Two, and possibly three other bifaces recovered from three of the sites may provide a basis for addressing the "transition" from dart and atlatl, to bow and arrow hunting technologies during the late Final Archaic and

CA-SDI-	Lab#	Cat No.	Provenience	Level (cm)	Item	Source	Hydration Mean
7322	1	7322-127	Unit 1	10-20	Biface frag.	Coso	4.6
7755	17	7755-13	STP N650 E080	20-30	Debitage	Obsidian Butte	1.9
7755	2	7755-191	Unit 1	10-20	Debitage	Coso	6.7
7755	3	7755-203	Unit 1	60-70	Debitage	Coso	10.2
7755	4	7755-246	Unit 3	10-20	Debitage	Casa Diablo	4.5
7756	5	7756-179	Unit 1	0-10	Debitage	Obsidian Butte	2.1
7756	6	7756-180	Unit 1	0-10	Debitage	Obsidian Butte	1.1
7756	7	7756-187	Unit 1	10-20	Debitage	Obsidian Butte	1.4
7756	8	7756-196	Unit 1	20-30	Debitage	Obsidian Butte	1.3
7756	9	7756-219	Unit 1	40-50	Debitage	Obsidian Butte	1.7
7756	18	7756-22	STP N395 W270	10-20	Debitage	unknown	4.9
7756	21	7756-100	STP N450 W135	30-40	Debitage	Obsidian Butte	DH*
7757	10	7757-104A	Unit 2	10-20	Debitage	Coso	3.2
7757	11	7757-105	Unit 2	10-20	Debitage	Obsidian Butte	2.4
7757	12	7757-109	Unit 2	20-30	Debitage	Obsidian Butte	2.1
7757	22	7757-87	Surface	-	Debitage	Obsidian Butte	3.1
7757	23	7757-88	Surface	-	Debitage	Coso	7.7
7759	13	7759-196	Unit 1	20-30	Debitage	Obsidian Butte	1.2
7759	14	7759-204	Unit 1	40-50	Debitage	Obsidian Butte	2.2
7759	15	7759-226	Unit 2	10-20	Debitage	Coso	7.2
7759	16	7759-267	Unit 5	0-10	Debitage	Obsidian Butte	3.3
7759	19	7759-93	STP N240 E200	10-20	Debitage	Obsidian Butte	2.6
7759	20	7759-95	STP N240 E200	20-30	Debitage	Obsidian Butte	2.4

Table 1: Obsidian sources and hydration measurement means (DH = diffused hydration band). Hydration Analysis performed by T.M. Origer, Anthropological Studies Center, Sonoma State University, Rohnert Park, California. Source Analysis performed by M.S. Shackley, Phoebe Hearst Museum of Anthropology, University of California, Berkeley, California.*

Table 2: Radiocarbon Dating Samples from Project Sites.
Radiocarbon Analysis performed by M.A. Tamers and D. G. Hood, Beta Analytic, Inc., University Branch, Miami, Florida.

CA-SDI-	Sample	Provenience	Level (cm)	Material	Conventional Age	Corrected Age†	Calibrated Age‡
7322	Beta-159766	Unit 1 (S97 W168)	30-50	Charcoal	1160+60 B.P.	1160+60 B.P.	1060 B.P. - A.D. 890
7322	Beta-159769	STP S100 W170	90-120	*Saxidomus nuttalli*	2410+40 B.P.	2190+50 B.P.	1800 B.P. - A.D. 150
7753	Beta-159767	Unit 3 (S80 E6)	30-90	Charcoal	520+50 B.P.	520+50 B.P.	530 B.P. - A.D. 1420
7756	Beta-156768	Unit 2 (N342 W279)	30-60	Charcoal	100+40 B.P.	100+40 B.P.	Outside of calibration range

† *Includes C^{13}/C^{12} estimated for charcoal samples (and included in Conventional Age), and reservoir effect correction for marine shell sample.*
‡ *Calibration curve intercept point..*

early Late Prehistoric periods in the area (Warren *et al.* 1998). One of these is the base fragment of an Elko Eared style of large side-notched dart point, and the other two are also larger side-notched types, but of a less definitive configuration (Figure 3).

As previously indicated, ceramic technology and Brown Ware ceramics were introduced to San Diego County in the Late Prehistoric period. The presence of ceramic vessels is often an indicator of storage and long term habitation. Vessel wares were visually identified as both Tizon and Salton Brown Ware. Tizon brown ware is made from residual clays found on the western side of the Peninsular Ranges. Salton brown ware is made from sedimentary clays in the desert, on the eastern side of the Peninsular Ranges. The presence of both wares on the west side of the mountains indicates a connection with the desert. A special study by Dr. John Hildebrand at Scripps Institute of Oceanography, using neutron activation analysis to provide a more objective sourcing, was conducted for a sample of 14 sherds, visually identified as Tizon Brown Ware. Of the 14 sherds, five were found to be Salton Brown, seven Tizon, and two unassigned. These results would appear to indicate that a larger percentage of the sherds recovered may be derived from the desert area. The remains of the ceramic vessels are small and fragmentary, and few diagnostic vessel sherds are present. The few diagnostic sherds indicate that they were shaped to be both cooking and serving bowls, as well as pots possibly used for cooking, storage, or ceremonial purposes. Carbon residue on 22 percent of the sherds also indicate use in cooking activities. The presence of a clay pipe indicates that either leisurely and/or ceremonial activities were taking place. Ceramic usage is documented for both males and females. Ceramic manufacture is documented for females; however, the literature is somewhat contradictory regarding male participation in manufacture (*cf.* Rogers 1936:21; Hohenthal 2001:168). The recovery of a single piece of clay daub may indicate a house structure or sweat lodge structure. The same seven sites containing ceramics also exclusively had bedrock mortars, and a connection between these activities seems apparent, whether the ceramics were used for storage of water for leaching acorns or for storage of acorn meal. Generally, the ceramic remains indicated a wide range of human activities, consisting of food preparation, cooking, and storage, and leisure and ceremonial activity. The range of ceramics recovered can be considered as consistent with the hypothesized settlement consisting of an aggregate of proximate sites representing a large, dispersed Late Prehistoric settlement associated with semi-permanent occupation and use.

The vertebrate faunal remains analyzed (Wake 2003), and the small quantity of invertebrates, included both locally available (i.e., on the property and in contiguous areas) terrestrial animals such as rabbit, deer, squirrel, pond turtle, and lizard, as well as animals that would have required travel and/or trade to procure such as marine fish and shellfish. The quantity and types of faunal remains present at the sites, together with the variety of flaked stone tools and the large number and variety of milling features present attests to both the intensity and diversity of resource procurement and processing activity associated with the sites. Testing results indicate that tasks such as hunting, butchering and the processing/working of the hides and bones of animals, the production of staple vegetal foods derived from various seed types including grasses, buckwheat, yarrow, and acorns, and possibly, the processing of fibrous plants such as yucca or bulrush were all being accomplished at the sites. Such a variety of activity would be necessary to produce meat and grain for food; animal sinew to create binding straps for a variety of purposes; and bone to make awls or soft hammer billets; as well as to process fiber to make twine for cordage for nets, or traps and snares and thatch for structure construction. All of these tasks are consistent with the tool protein residue and pollen results and with the use-wear

Table 3: Ceramic artifact recovery.

Item	7322	7753	7754	7755	7756	7757	7759	Total	Percent
Body sherds	7	46	10	28	134	8	12	245	95.7
Rim Sherds	1	2	-	2	2	1	1	9	3.5
Daub	-	-	-	1	-	-	-	1	0.4
Pipe fragment	-	-	-	-	1	-	-	1	0.4
Total	8	48	10	31	137	9	13	256	100.0

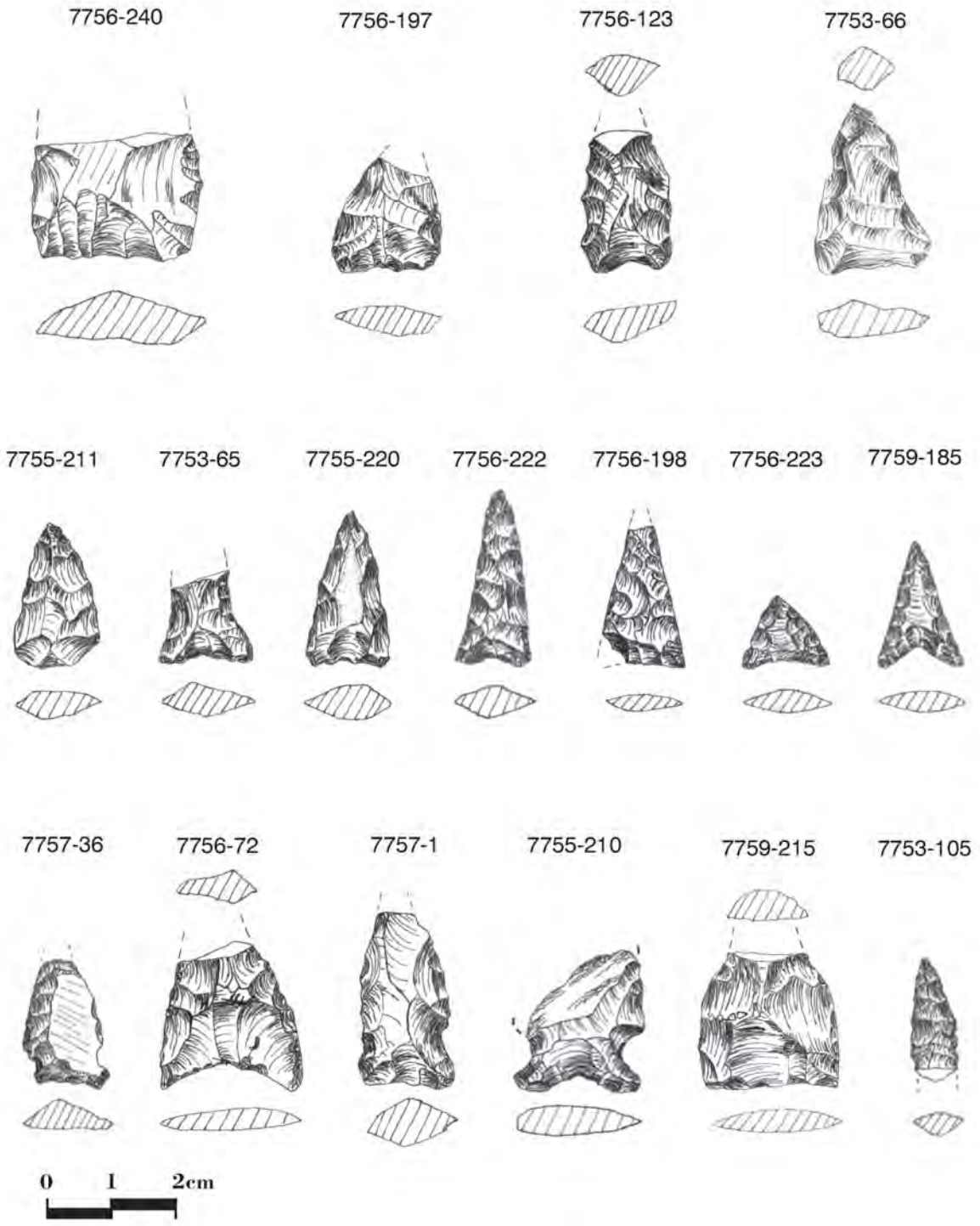

Figure 3: Arrow point preforms, arrow and dart points, and drills (illustrations by Kristen Walker).

observed on milling feature elements and ground stone tools and on many of the formal flaked tools as well as on the utilized flake/chunk tools.

The plant taxa indicated by the pollens found on the ground stone tools and by identified carbonized seeds retrieved from the macrobotanical column samples (Popper 2002), taken from two of the site areas, were analyzed in combination with information contained in the local ethnographic and/or in the botanical literature concerning prehistoric gathering practices and the most opportune times of the year during growth cycles for gathering plants or plant seeds. The results suggested that procurement of the represented vegetal resources, by the inhabitants of the sites, would have been most productive during late winter through to the beginning of fall, i.e., from approximately January or February to September (Table 4).

The question of prehistoric settlement at this location, due to the likely presence of a spring or springs, was addressed through botanical and historical research, and through faunal analysis. Botanists compiled a complete list of the plants currently present on the property (Nordby and Robbins 2003). This list and the pollen record generated in palynological studies, were used to distinguish a number of plant types that could be associated with a standing water environment such as a freshwater marsh. Such an environment would likely have been generated by, and be present around, a spring or seep. The botanical studies also defined four areas of the property, currently containing seep vegetation. Two of these areas are situated along a small tributary of the creek near the confluence with Santa Maria Creek where the most of the large site loci are clustered. In this area today, there is a pond that was artificially created circa 1950-60, by the construction of an earth dam on the tributary. It appears that this dam now impounds water from one of the original spring or seeps shown on the historic map at this location. It was hypothesized that a seep or spring-fed marsh environment could have significantly enhanced resource availability for prehistoric hunter/gatherers. Faunal evidence recovered from the sites, however, only partially correlated with this hypothesis. While a relatively large quantity of pond turtle remains were present in the sample, no remains of aquatic birds or remains identified as freshwater fish were recovered. The quantity of pond turtle does suggest that more were available for capture than would likely have been the case from Santa Maria Creek alone. The plant lists compiled from both the current property survey and from the pollen record demonstrated that a standing water-oriented plant community is, and has been, present within the proximity of these major site loci. In combination, the results of these studies identified a possible local microenvironment that may correlate with the locations of the most substantial site loci and thereby suggest an additional causal factor for the presence of a principal prehistoric habitation at this location.

CONCLUSIONS

While the archaeological results obtained could be considered as consistent with a winter/spring occupation of the sites, they did not conclusively verify that this is the case. The four radio carbon dates, which derived from only three of the 32 sites, varied considerably in time. They spanned a period from roughly A.D. 1850 to A.D. 150 with intervening dates of A.D. 890 and A.D.1420. The presence of Cottonwood Series projectile points, ceramics, and Late Prehistoric Period Obsidian Butte obsidian with appropriate hydration readings, and the late radiocarbon dates, indicate that the project sites were mainly occupied during the Late Prehistoric period (post A.D. 900), up to the contact period in the early 1800s. The presence, however, of an A.D. 150 radiocarbon date; one, and possibly two, Elko Eared biface fragments; Coso obsidian with appropriate hydration readings, well as the recovery in the excavations of a few highly patinated artifacts may suggest that an earlier Final Archaic occupation (i.e., circa 2000 B.C. to A.D. 700) is present at the sites. These results, while obviously not verifying the contemporaneity of the sites, also do not preclude contemporaneous occupation of the sites. They do indicate that this location has been recurrently occupied by prehistoric people for nearly 2,000 years.

Other study results indicate a level of habitation intensity consistent with a village occupation at the sites and give evidence that seasonal use of the sites was a probability. The diversity of resource processing at the sites expressed in the tool types and in the pollen and residue studies is augmented by the presence of several aspects that would appear to distinguish them as a residential site including a ceramic pipe fragment and several rock enclosures. These latter aspects suggest that the sites may have had additional significance in the settlement system of the inhabitants (Minor 1975; Carrico 1988; Van Wormer and Carrico 1993). The results of an analysis of a combination of floral and faunal information suggest that procurement of some of the represented plant and animal resources by the inhabitants of the project sites, would have been most productive during late winter through to the beginning of fall, i.e., from

Table 4: Seasonality of mano pollen and flotation seed taxa. Dashes indicate either that there is no evidence of use or that the category contains too many candidates to delineate a collecting period.

Mano Pollens **Season**	**Winter**		**Spring**		**Summer**		**Fall**	
Alnus sp. (alder)	-----	-----	-----	-----	-----	-----	-----	-----
Pinus sp. (pine)								
Populus-type (cottonwood)	-----	-----	-----	-----	-----	-----	-----	-----
Prosopis-type (mesquite)								
Quercus sp. (oak)								
Artemisia sp. (California sagebrush)								
Erigonum sp. (buckwheat)								
Adenostoma-type (chamise)	-----	-----	-----	-----	-----	-----	-----	-----
Ephedra sp. (Mormon tea)								
Erodium cicutarium (filaree)								
Lycopodium sp. (clubmoss)	-----	-----	-----	-----	-----	-----	-----	-----
Plantago (plantain)	-----	-----	-----	-----	-----	-----	-----	-----
Anacardiaceae (sumac family)								
Liguliflorae (chicory) (Rafinesquia sp.?)								
Asteraceae (low /high-spine, sunflower family)	-----	-----	-----	-----	-----	-----	-----	-----
Poaceae (grass family)								
Brassicaceae (mustard family; native species)								
Cheno-Am (goosefoot-pigweed)								
Sarcobatus sp. (greasewood)	-----	-----	-----	-----	-----	-----	-----	-----
Euphorbia sp. (spurge)	-----	-----	-----	-----	-----	-----	-----	-----
Trichostema-type (vinegar weed, bluecurls)								
Trilete rugulate (fern)	-----	-----	-----	-----	-----	-----	-----	-----
Floation Seeds								
Bromus sp. (brome grass) (native species)								
Chenopodium sp. (goosefoot)								
Convolvulaceae (morning-glory)	-----	-----	-----	-----	-----	-----	-----	-----
Deschampsia sp. (hair grass)								
Fabaceae (pea family) (Trifolium sp.?)								
Lathyrus sp. cf. (wild pea)								
Lotus sp.	-----	-----	-----	-----	-----	-----	-----	-----
Hemizonia sp. (tarweed)								
Hordeum sp. (barley)								
Lamiaceae cf. (mint family)	-----	-----	-----	-----	-----	-----	-----	-----
Malosma laurina (laural sumac)	-----	-----	-----	-----	-----	-----	-----	-----
Marah sp. cf. (wild cucumber)								
Rumex sp. (dock)								
Scirpus sp. (bulrush)								
Solanaceae (datura, nightshade, tobacco)	-----	-----	-----	-----	-----	-----	-----	-----
Vulpia/*Festuca* (fescue grass)								

approximately January or February to September. Consequently, it appears likely that the sites represent a village level occupation that occurred during these months of the year.

In sum, the number, intensity, and variety of activities at these sites indicating village level habitation and seasonal use; the sourcing of lithic, ceramic, faunal remains indicating mostly local, but also use of more distant resources; and evidence for a recurrent occupation of these sites for nearly 2,000 years, a time depth not initially anticipated, seem to reflect the presence of a primarily Late Period village or rancheria complex with a possible earlier basal component. The apparent presence, at this location, of a spring or springs indicated not only on historic maps, but also by the considerable presence on the property of relevant flora, both past and present, also lend credence to location of a more substantial prehistoric occupation at this location. Consequently, while not entirely definitive, these results could be judged as consistent with these site loci representing the location in the Ramona Valley of the ethnohistoric village of Pa'mu.

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