PREHISTORIC RESOURCE USE AND SETTLEMENT IN THE LOWER SANTA YNEZ RIVER BASIN: INTRODUCTION AND OVERVIEW TO THE UNION OIL ARCHAEOLOGICAL MITIGATION PROJECT

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ABSTRACT

This symposium presents some of the results of archaeological investigations of 23 archaeological sites on Vandenberg AFB in northern Santa Barbara County, an area once occupied by the poorly known Purisimeno Chumash. The present paper serves to provide an overview of project goals and research design. The status of the project is also discussed. The research emphasized paleoenvironmental reconstruction of the last 11,000 years; ethnohistoric studies of research use and settlement; the study of prehistoric resource use through floral and faunal analyses; reconstruction of land use patterns from quantitative analyses of debitage data and high-magnification microwear studies of chipped stone tools; and definition of site structure and site function. Quantitative comparisons with data from Glassow's MX archaeological investigations in other areas of Vandenberg AFB provide a larger, more regional context for describing resource use and settlement in the Purisimeno territory.

INTRODUCTION

Today we will be discussing the archaeology of the Purisimeno and their predecessors who occupied areas north of Point Conception in Santa Barbara County (see Figure 1). Most archaeology in the Santa Barbara region has focused on the Channel Islands and the Barbareno Chumash who lived south of Point Conception. As a result, cultural descriptions of the Chumash traditionally emphasize the highly complex Barbareno, even though Chumash living in other areas had very different ecological adaptations. Only within the last few years has a more realistic picture of Chumash cultural variability emerged (Glassow and Wilcoxon 1988; Horne 1981; Grant 1978).

Purisimeno settlement and subsistence patterns are not known in any detail. Few large areas of the Vandenberg region have been intensively surveyed and much of the excavation data has not yet been reported. These limited data suggest that the Purisimeno practiced a more mobile, more terrestrially oriented

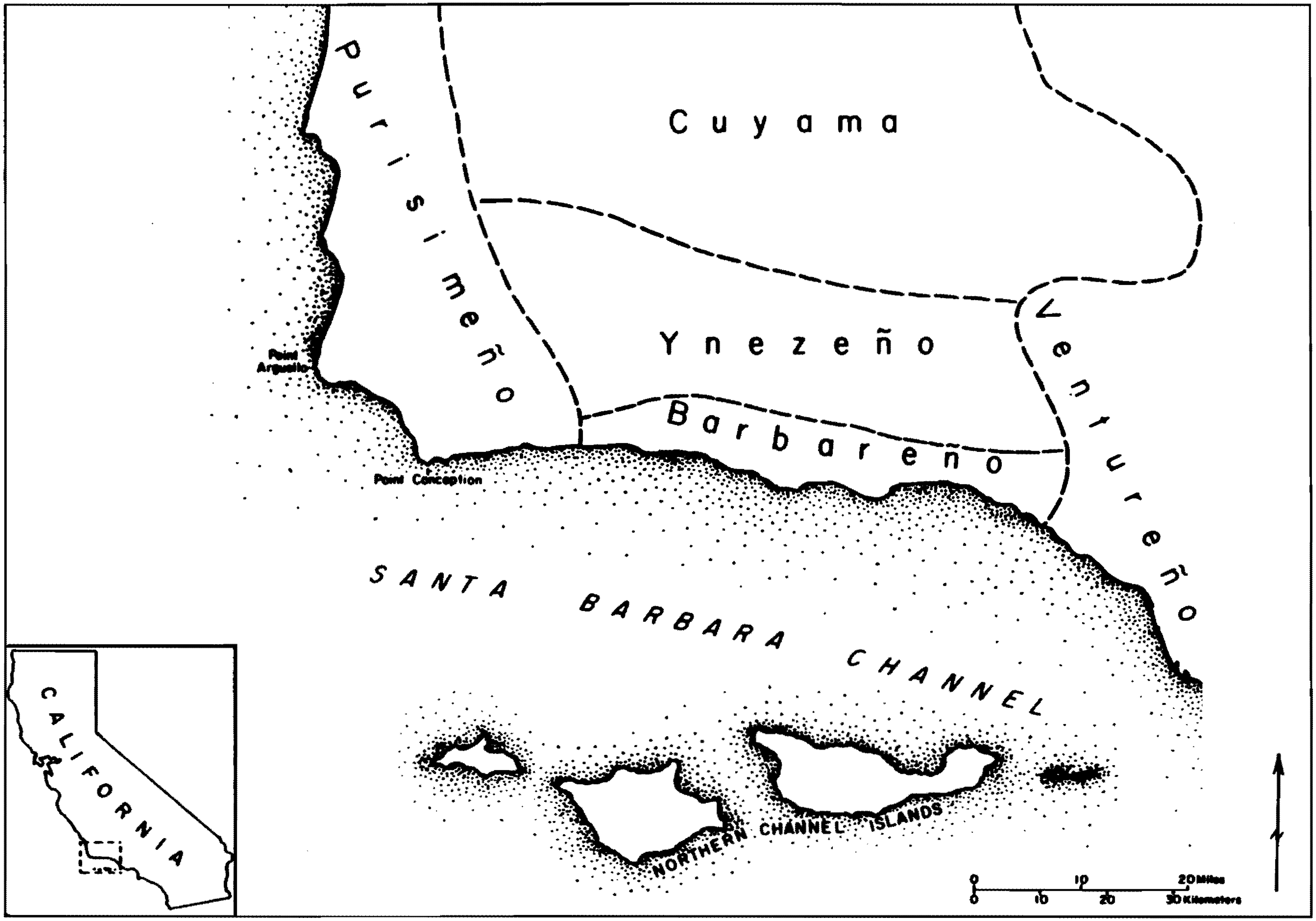

Figure 1. Chumash groups in the Santa Barbara Channel region.

subsistence strategy than the Barbareno, but this generality does little to adequately describe this cultural system nor does it explain how it arose.

The most comprehensive study prior to the Union Project was Glassow's report on the MX Project (Chambers Consultants and Planners 1984), which involved large-scale survey and rather limited testing of 24 sites located on the San Antonio Terrace, a large, environmentally unique part of the Purisimeno territory (see Figure 2). Archaeological materials from this large coastal dunefield appear to derive from field camps and locations produced by small groups of hunters who were probably searching for deer. In fact, the report convincingly argues that there may not have been another tract of land as large in the region where deer hunting could be as effectively carried out. The special-use nature of the San Antonio Terrace clearly indicates that these sites were once part of a larger regional settlement system, and a rather late one at that. The San Antonio Terrace sites all seem to date to the last 2,000 years, although few could be firmly dated by radiocarbon means.

The MX report is a landmark study in regional archaeology not only for its substantive contributions but also because it presents for the first time a regional research design and analytical approach specifically designed for sites and conditions found in the Vandenberg area. For example, the report convincingly demonstrates that the low-density sites that compose most of the local archaeological record have a great potential to inform us about hunter-gather mobility patterns, subsistence goals, and other critical research issues. Most research into these issues has focused on organic remains as evidence for changing strategies of resource exploitation. The MX report illustrates that chipped stone materials have a tremendous research potential as well. Given that the chipped stone is the only data class common to all sites in the region -- most Vandenberg sites are low-density lithic scatters that may or may not have small amounts of organic remains -- the MX report provides a foundation for all future research to build on. And build on it we have. We have designed our research to complement and to be comparable with the MX study to the greatest extent possible because we believe that the only way to build a picture of regional patterns is to use consistent data collection methodologies. In light of our desire to contribute to the growth of a regional database, all of our artifact analyses included a quantitative comparison with similar data from MX sites. This comparison was successful only because the data classes we emphasized, the variables and attributes we measured, and the analyses we conducted were designed to be as compatible as possible with MX data, although our research program was explicitly designed to avoid the many sampling problems that plagued the MX Project.

Our work centered along a 25-mile-long Union Oil pipeline running from the mouth of the Santa Ynez River to a refinery

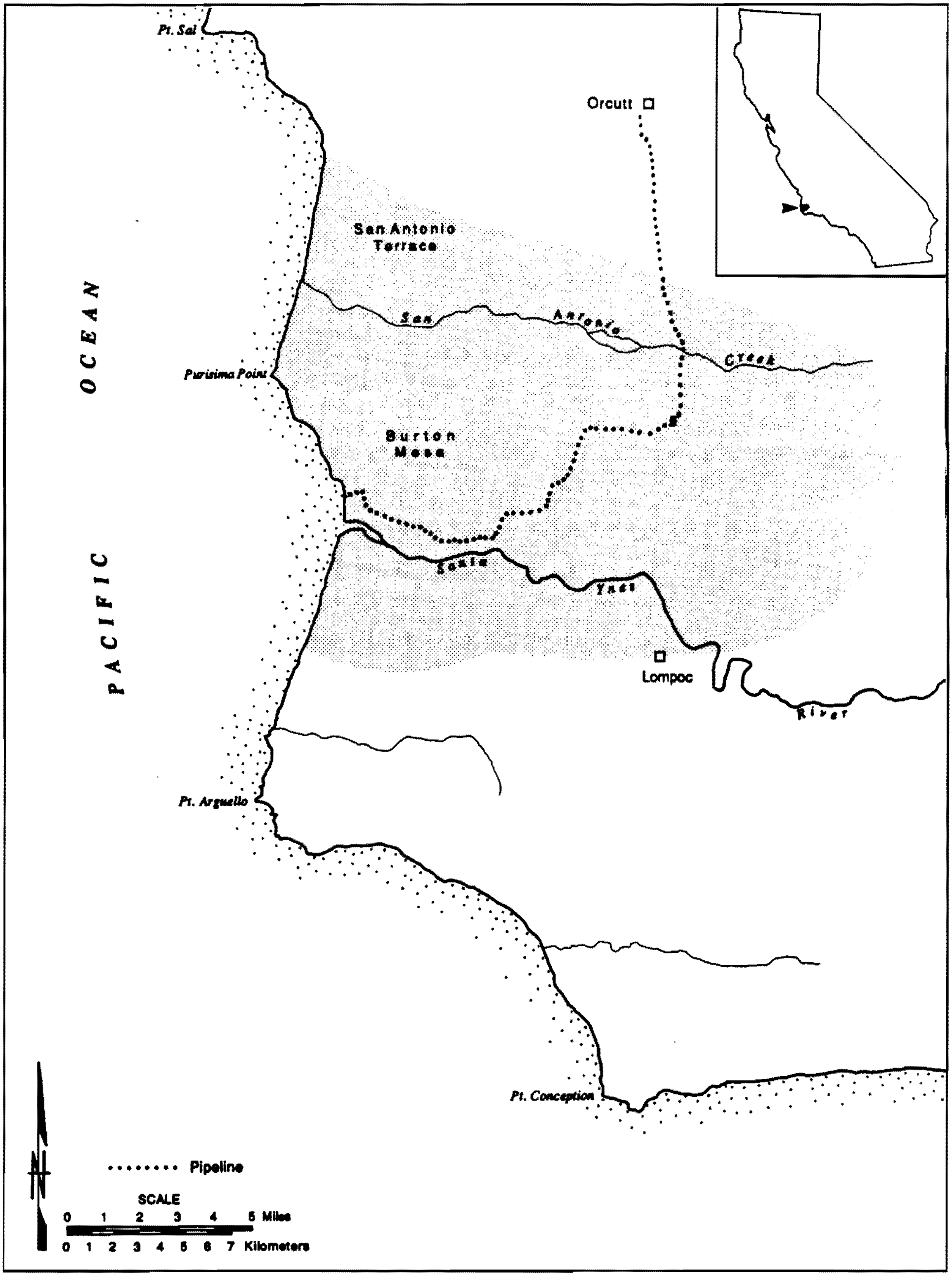

Figure 2. Regional location of the project area.

near Orcutt, California (see Figure 2). To place our work in a broader context, we defined a much larger study area that includes the Santa Ynez River Valley, Burton Mesa, San Antonio Creek, the San Antonio Terrace, and the Purissima Hills. By the time fieldwork was completed in the fall of 1986, over 700 cubic meters of earth from 23 prehistoric sites had been excavated and screened (see Figure 3).

The Union Project provided an ideal opportunity to address major gaps in our knowledge about the Purisimeno and their predecessors. First, the great length of the pipeline allowed us to study sites from a wide range of environmental zones, many of which have never been subject to intensive archaeological study.

Second, we were able to conduct extensive excavations at a number of sites. Most recently reported excavations (e.g., Chambers Consultants and Planners 1984; Neff 1982) consist of shovel probes sometimes augmented by one or two small test pits. (Although early excavations by Ruth [1936, 1937] and Carter [1941] were more extensive, poor data controls and other problems severely limit their usefulness for modern research).

Third, our sample included sites from all major cultural periods. Most previous work concentrated on relatively late sites (e.g., Chambers Consultants and Planners 1984).

Fourth, the pipeline trench exposed numerous areas that yielded important paleoenvironmental data. The systematic collection of palynological, sedimentological, and geomorphic data have allowed the reconstruction of local climatic and vegetative changes over the last 11,000 years. This is the first paleoenvironmental reconstruction for the Vandenberg region.

Fifth, we were able to design a multistage data recovery project that solved major problems associated with low-density sites obscured by vegetation, dune sands, and other sediments. As a result, we were able to ensure that we recovered adequate sample sizes of key data sets critical to our research goals. Previous investigations, including the MX Project, lacked a multistage research design and were plagued by inadequate sample sizes due to the difficulties and time required to investigate low-density sites.

Sixth, we developed explicit means of evaluating the validity and reliability of our analytical results, a growing issue among archaeologists, particularly those concerned with the analysis of chipped stone (e.g., Keeley and Newcomer 1977; Odell and Odell-Vereecken 1980; Shea 1987; Hurcombe 1988; Bamforth 1988). To address this issue in our own analysis, we conducted a blind test to evaluate the ability of our microwear analyst to infer the uses of chipped stone tools using Keeley's (1980) "high-magnification" approach. The results of this

This page has been redacted to protect the location of this site. Should you require specific location information, please contact the SCA Business Office at office@scahome.org highly successful blind test will soon appear in the Journal of Archaeological Science (Bamforth, Burns, and Woodman 1990). We also conducted a test to determine whether debitage analysts unconsciously changed their measurement techniques during the course of the analysis. These tests allowed us to identify and resolve data problems prior to analysis and interpretation.

RESEARCH DESIGN

The ultimate goal of the Union Project is to provide data relevant to reconstruction and accounting for the development of cultural complexity in the Chumash culture area (see Figure 4). Complexity is conceived here in terms of the organization of resource procurement and land use. Following most cultural-ecological research in anthropology, the approach taken here views human adaptations as strongly influenced by the abundance and distributions of potential resources in the environment. Given a particular level of technology and population size, variation in environmental conditions is expected to lead human beings to select different combinations of resources in different proportions and to organize and locate themselves differently within a region. This approach is nicely summarized by Binford's (1980) forager-collector model which relates organizationally different adaptive strategies to structurally different environments.

Binford's model is particularly relevant to research in the Chumash culture area because the complex Chumash society that existed after A.D. 1100 was based on a high degree of logistical mobility (Bamforth 1984; Glassow 1984; Woodman and Rudolph 1990). In terms of the model, they were collectors. Although we know very little about how this system arose, most think it evolved from a much simpler foraging system based on a high degree of residential mobility (Landberg 1965; Spanne 1975; Bamforth 1984). Binford's model is also useful because foraging and collecting strategies generate different types and proportions of sites that can be distinguished by varying combinations of manufacture, extraction, maintenance, and processing activities. Table 1 presents a simplified view of the interrelationships between site types and activities, the latter of which are largely structured by resource procurement goals; the duration, intensity, and season of site use; and group size.

This approach led to our emphasis on four interrelated issues:

- o Resource use and procurement,
- o Mobility and land use patterns,
- o Demographic arrangements, and
- o Paleoenvironmental change.

Evolution of Chumash Settlement and Subsistence

- Simple → Complex
- Forager → Collector

Issues

- Resource Use & Procurement
- Mobility & Land Use Patterns
- Demographic Arrangements
- Paleoenvironmental Change

Figure 4. Research topics.

TABLE 1

ACTIVITIES ASSOCIATED WITH BASIC SITE TYPES

Site Type	Maintenance	Processing	Extraction	Manufacture
Residential base	+	+		+
Location			+	
Field camp	+	+		+
Station	+			+
Cache				

Source: Bamforth 1984.

Our focus on resource use and procurement involved three related studies (see Figure 5). To provide an environmental baseline, URS biologists described the study area in terms of terrestrial and marine habitats with an emphasis on species known to have been used by the ethnohistoric Chumash. Terrestrial habitats were inferred by examining the soils, slopes, and water conditions associated with modern native communities and extrapolating to other parts of the area where native vegetation no longer exists. Marine habitats were defined primarily from modern distributions of estuaries and nearshore substrates. Resource maps showing the probable past distribution of habitats in the study area were prepared. These reconstructions provide a reasonably good description of environmental conditions at the time of Spanish contact.

Plant and animal species from each habitat were described in terms of their overall abundance and the spatial and seasonal variation in their density and distribution. We could not perform comparable levels of analysis for all species so we concentrated on key species and species of moderate importance. Key species are those known to have been ethnographically important sources of food or those whose remains were relatively common in our sites. Species of moderate importance include (a) those that were present but not common in our sites, (b) those that were common in our sites but were probably not used for food, (c) those known to have been only moderately important to Chumash groups, and (d) species of interest to archaeologists for understanding site disturbance processes.

The environmental baseline provided the means to assess the exploitive potential of various habitats, and it allowed us to more fully interpret floral and faunal remains in terms of prehistoric patterns of habitat and resource use.

This reconstruction of the environmental baseline depended on data derived from Chester King's ethnohistoric research, the second study concerned with resource exploitation (see Figure 5; King 1988). This research focused on patterns of resource use and settlement for the ethnohistoric Purisimeno, particularly as these relate to our project area. Ethnohistoric accounts and

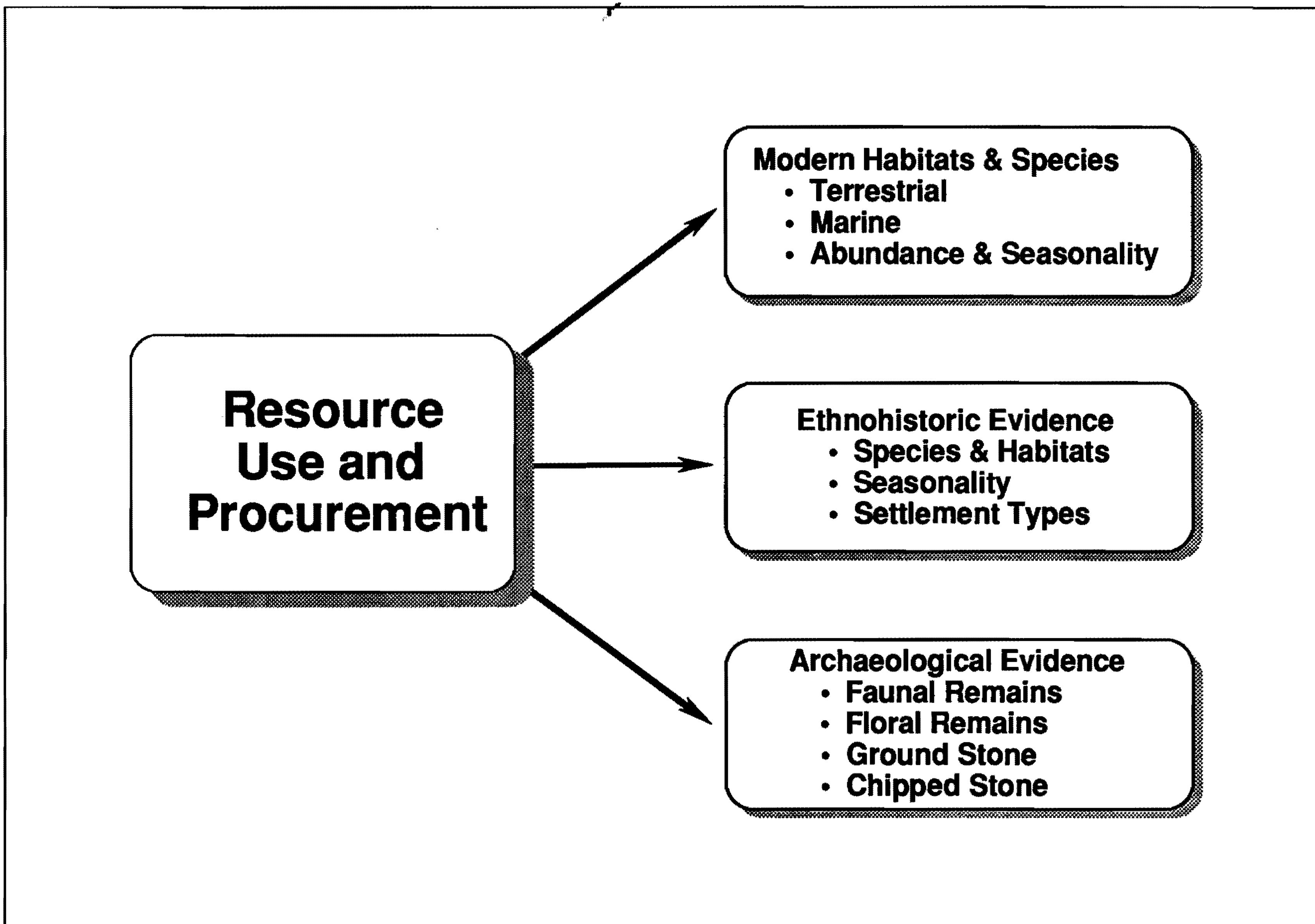

Figure 5. Resource use and procurement studies.

environmental data were used to determine types of resources used, parts of resources used (e.g., greens, roots and bulbs, seeds), seasons of use, and procurement and processing methods, among other things. King has gathered a tremendous amount of data that complements and expands a similar study he did for the MX Project (King 1984). Together, these reports represent a significant contribution to our knowledge of this important but little known Chumash group.

Archaeological remains provided the most direct evidence for prehistoric resource use (see Figure 5). The faunal analysis focused on habitat use, dietary emphasis (including protein contributions), and seasonality. In addition to studies of resource use, faunal data were used to characterize each site in terms of the density and the diversity or richness of taxa represented. We used this data to help differentiate sites on the basis of intensity and duration of use, characteristics important to the definition of site function. These data were also used to compare data from Union sites with those from MX sites in order to address questions of regional variability.

Jim Rudolph's paper (this volume) will later provide alternative explanations for the size of shellfish recovered from the Union sites (see also Rudolph 1988).

Macrobotanical remains were recovered, but we cannot demonstrate that they were in fact used by the site's occupants. They could have been introduced by rodent disturbance.

Ground stone proved to be an unexpected source of information about resource use (Bowser 1988). Although few California archaeologists do so, we conducted experiments to determine the nature and rates of use wear formation on local varieties of sandstone. With this data in hand we proceeded to microscopically inspect each potential ground stone artifact for use wear. In addition, we examined fire-cracked rock and so-called "unmodified cobbles" because we suspected that brief grinding activities might not generate obviously used tools. Not only did this prove to be correct, but we also discovered burned chenopodium seeds embedded in the grinding surfaces of 5 manos and 1 metate. Many archaeologists recognize ground stone solely from casual inspection and "feel." The methods and techniques used in the Union analysis not only provide more objective criteria for identifying ground stone, even those that lack macroscopic evidence of use, but they also provide another means of recovering organic remains from archaeological sites.

Chipped stone evidence for resource use was derived from an intensive microwear program using the high-power magnification techniques developed by Laurence Keeley (1980). These techniques allowed Douglas Bamforth to distinguish tools used on plants, bone, shell, wet hide, dry hide, meat, and wood. To ensure the reliability of our results, we first submitted 20 experimental tools to Doug for analysis. Results of this blind test indicate that his interpretations have a high level of accuracy (Bamforth 1988; Bamforth, Burns, and Woodman 1990). Because Bamforth used a similar approach in his earlier analysis of sites investigated during the MX Project (Bamforth 1984), the Union site analysis broadens our understanding of land use patterns.

Prehistoric mobility and land use patterning (see Figure 6) is the second major issue addressed by our research. Chipped stone provided the best information on these topics. At the most basis level, these topics require that we identify the types of activities that occurred throughout a region. To attain this goal, our chipped-stone analysis generated data on

- o Classes of tools produced at Union sites and production stages represented by cores and debitage,
- o Tool use, and
- o The kinds and sources of raw materials used in chipped-stone manufacture.

A paper summarizing Bamforth's analysis of the chipped stone assemblage is presented later in this volume, so I will just say that I think anyone concerned with lithic analysis and hunter-gatherer adaptations should examine this work, particularly the full text contained in the project's soon-to-be-published final report (Woodman and Rudolph 1990). It represents a state-of-the-art approach that has wide applicability. Unlike many lithic analyses, it generates data that are directly related to meaningful kinds of human behavior. Again, Bamforth's analysis of chipped stone recovered during the Union Project complements a similar study he conducted for the MX Project (Bamforth 1984) and expands our geographic knowledge of prehistoric patterns of land use.

As I noted earlier, one of the advantages of the forager-collector model is that it makes clear that different adaptive strategies and their associated mobility patterns are archaeologically detectable because they generate different types and proportions of sites. All our artifact analyses were structured, therefore, to feed into the problem of assigning site function. Given that different types of sites can be distinguished by the varying combinations of exploitive and maintenance activities that were conducted at them, the research places a major emphasis on reconstructing on-site activities and intensity of use (see Figure 6).

We also placed an emphasis on defining the structure of sites (see Figure 6) because sites that differ in terms of duration and intensity of use also differ in terms of site structure complexity. The conceptual basis of our approach is derived from James O'Connell's 1987 American Antiquity article on Alyawara site structure and its archaeological implications.

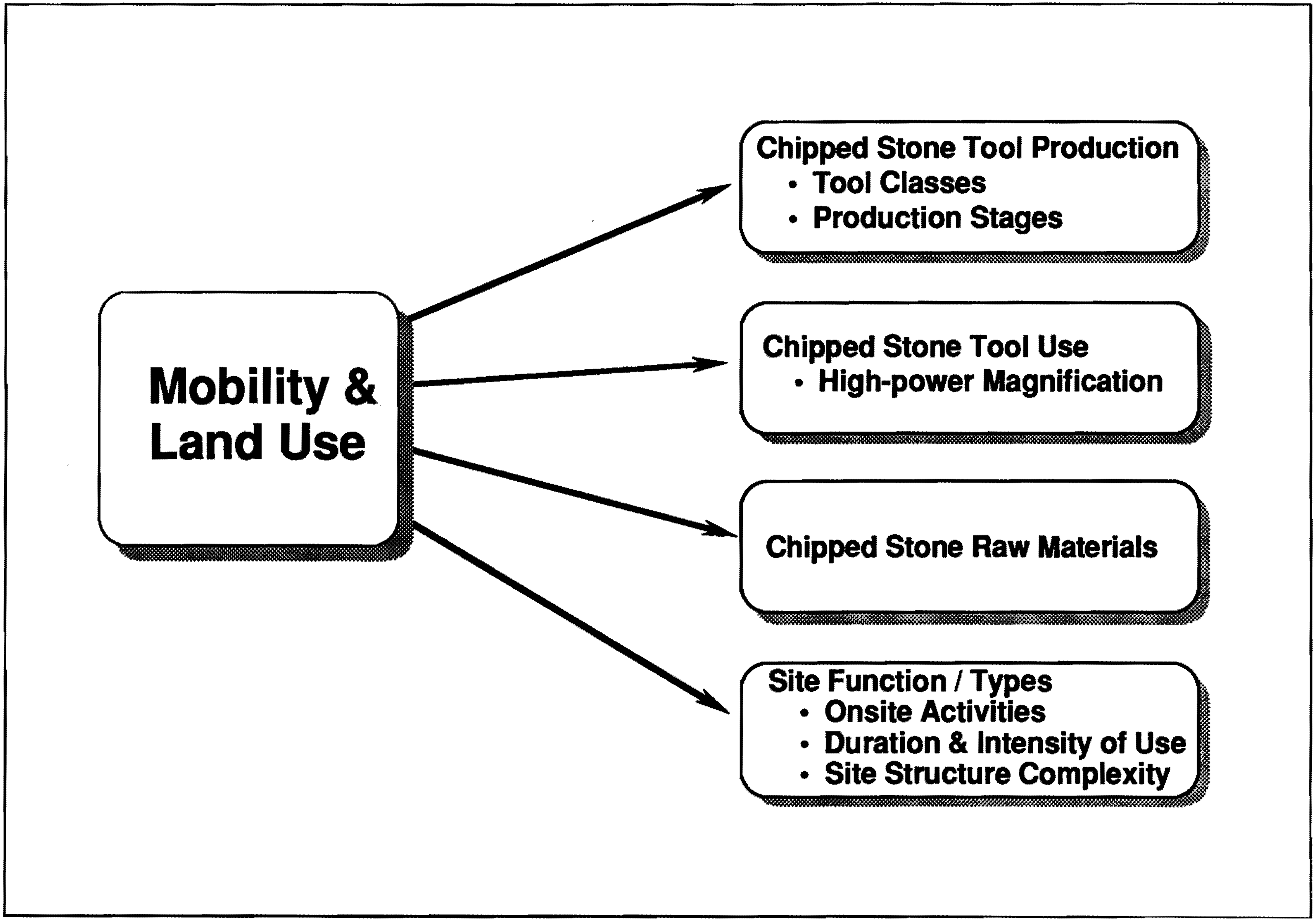

Figure 6. Prehistoric mobility and land use studies.

Kevin Peter's summary of his site structure analysis of the Union sites (Peter 1988) will be presented later in this volume. We believe that this analysis represents an important methodological contribution because many hunter-gatherer sites have structure that is not easily defined due to the lack of structural remains. This problem is often compounded by low artifact density and poor site visibility due to vegetation, alluviation, and other natural processes.

Demography is the third issue addressed in our research (see Figure 7). Different subsistence strategies result in different arrangements of people across the landscape so our research analysis addresses group size through a consideration of site size, number and sizes of features, site structure, and the density and diversity of archaeological remains. Much of this approach is relatively standard, but defining group size at Vandenberg sites is a difficult problem because of site reuse and non-cultural processes.

To the extent that we can identify contemporary sites, we have also contributed to the study of population density. Although Figure 6 subsumes radiocarbon dating under the study of population density, good chronological control is so central to our overall project goals that dating can be considered one of our primary research issues. We decided early on to develop an extensive radiocarbon dating program because a prehistoric chronology for the Vandenberg region really does not exist. Although King's (1981)Early- Middle- Late-Period chronology has been adopted for local use, we really do not know how well Vandenberg sites conform to the typical definitions assigned to these periods (Glassow 1984:7-3). Temporally diagnostic artifacts are rare, and only a small number of sites have been radiocarbon dated. Of these, most are represented by only one or two dates.

To improve the situation, we tried to obtain as many dates as possible from different levels and areas of each site. Lotus spreadsheets and computer plots were generated to identify vertical and horizontal artifact concentrations that might indicate different components and activity areas. If possible, multiple radiocarbon samples were collected from similar proveniences to cross-check results and to identify anomalous dates. If necessary, we augmented standard dating techniques with AMS analyses for small samples (Woodman 1988).

Forty-nine new dates were obtained for 12 sites and 18 other dates were obtained for pollen samples used in our paleoenvironmental reconstruction. Our dating program revealed that the Union sites fall in all major cultural periods, ranging from a 9,000-year-old Early Period village to several sites occupied as late as 1500 A.D. (Woodman 1988).

Our fourth major research issue is paleoenvironmental change (see Figure 8). Using geomorphic, sedimentological, and

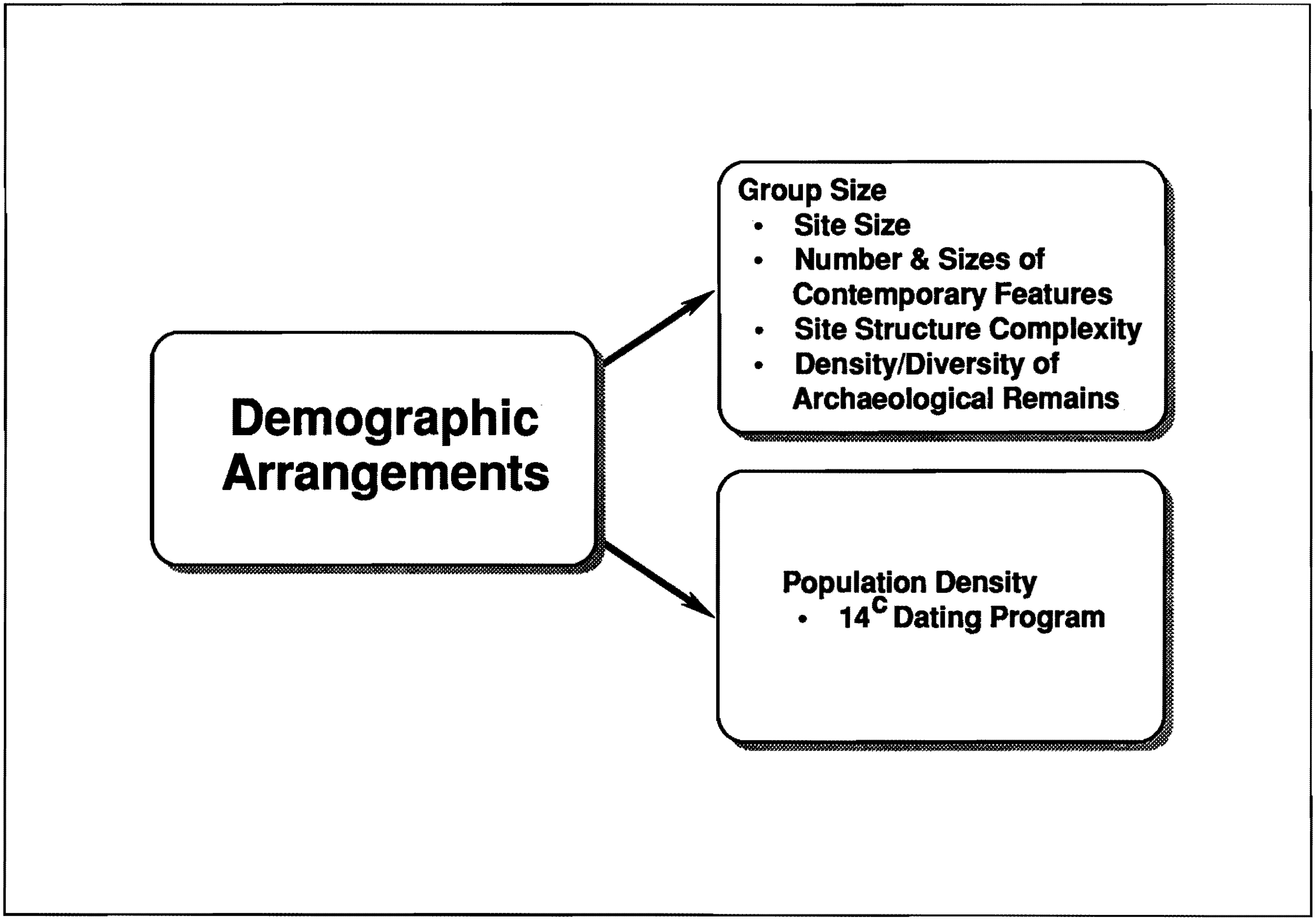

Figure 7. Demographic studies.

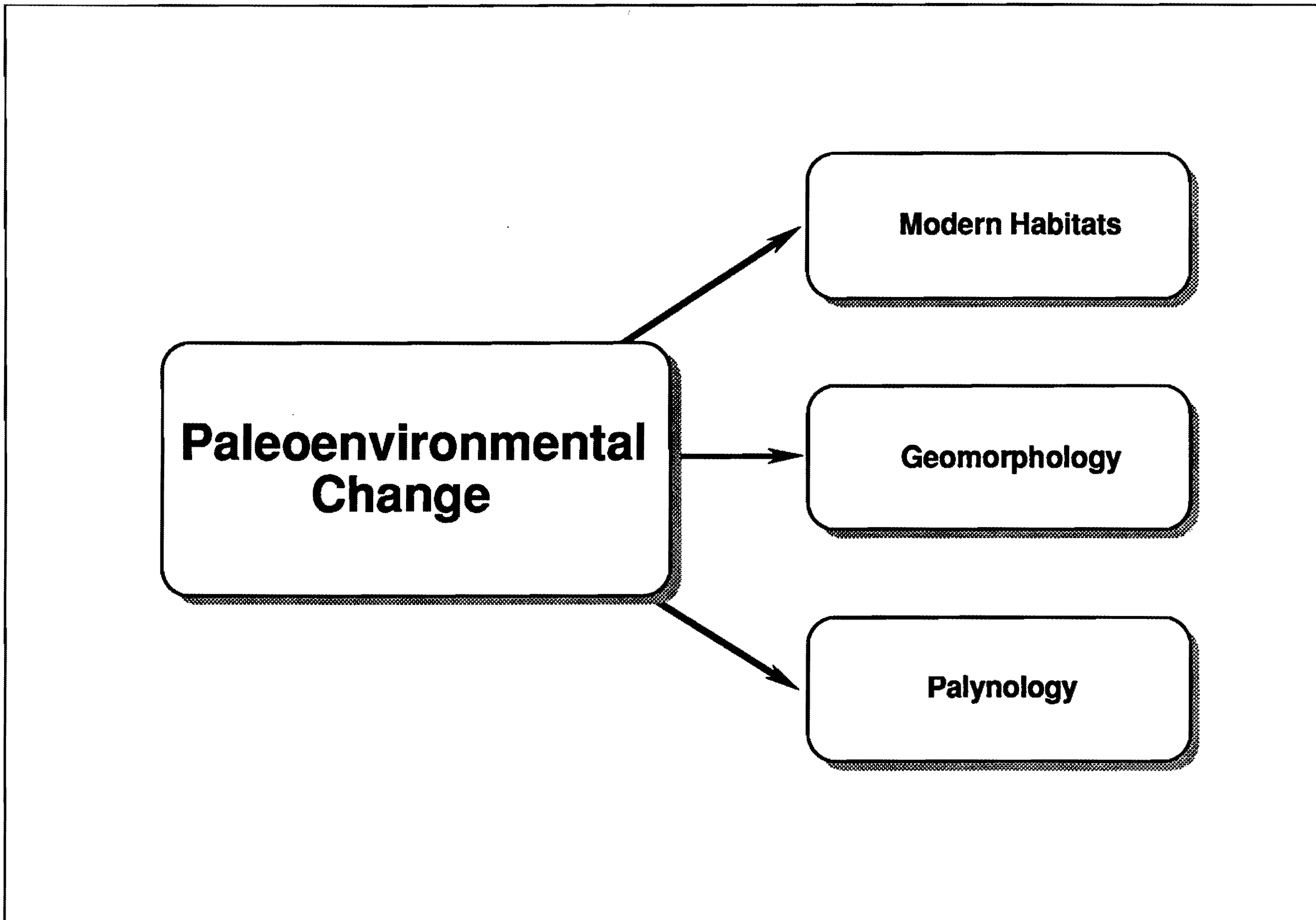

Figure 8. Paleoenvironmental change studies.

palynological data collected by Union Project specialists, we have reconstructed local paleoenvironmental conditions over the past 11,000 years (Morgan and Scott Cummings 1988). Tony Morgan, project geomorphologist, summarizes this important research elsewhere in this volume.

SAMPLING DESIGN AND FIELD PROCEDURES

In designing our approach to the field investigations, we felt we had to come to grips with four basic problems:

1. We only had limited knowledge about vertical and horizontal variability within our sites, some of which were exceptionally large and/or obscured or buried by a variety of natural processes.

2. We had little time to determine the structure of these sites because our work could not begin prior to construction. All work, including the evaluation and mitigation of sites discovered during construction, had to occur in such a way that construction schedules were met.

3. Although difficult to accomplish, determining horizontal and vertical structure of the Union sites was critical to our research goals.

4. We had to ensure that we retrieved adequate numbers of artifacts in order to minimize sample size problems during the analysis phase of our work.

To solve these problems, our research design was structured according to a multistage framework that resulted in daily feedback between the field and the lab (cf. Redman 1973, 1987). Because we had explicitly defined the types and amounts of data needed and how these data could be measured in the field, we were able to continuously monitor our progress in light of the research questions we ultimately wanted to address. This ability to monitor allowed us to constantly refine our data recovery strategies and methods (cf. Redman 1973, 1987).

We had two research goals that had to be satisfied by our sampling design:

1. Estimation of the numbers and kinds of cultural remains within the area of impacts, and

2. Identification and interpretation of intrasite distributions of those remains.

As a result, we decided to use both probabilistic and judgmental sampling procedures. Probabilistic procedures gave us unbiased estimates of the artifact populations, while the judgmental approach allowed us to efficiently characterize intrasite patterning.

At each site, the pipeline construction corridor was divided into a series of 20-by-20-meter sampling strata (see Figure 9). In the first stratum, two 1-by-1-meter test units were randomly selected for excavation (note: Figure 9 illustrates that our initial plan was to excavate 1-by-2-meter test units). The pattern of unit selection was then systematically repeated for all remaining strata.

Two days after the excavation of these initial units, preliminary analysis was completed, data were entered into field computers, and Lotus tables and graphs were generated that described the density and distribution of all major data categories. Such data allowed us to compare all sampling strata on the basis of artifact density and diversity in order to determine where to locate and how to excavate our judgmental samples. These samples were located to investigate higher density artifact concentrations and features that could represent activity areas or other discrete units of human activity.

Results of the judgmental excavations were also monitored continuously with Lotus output, thereby allowing us to modify our data recovery strategies whenever necessary to ensure program efficiency and effectiveness. For example, during the planning stage of our research, we determined that chipped stone was the only artifact category that could be recovered in statistically adequate samples. We therefore established minimum data requirements for all sites, activity areas, and other units of analysis, and we kept excavating until those requirements were met.

The Lotus data were also critical in determining when we could use backhoes for data recovery, and we needed to use them whenever possible. Not only did we have a tight construction schedule to keep up with, but the low-density nature of the sites required us to excavate relatively large quantities of deposits so that we could meet minimal data needs. However, we felt it was prudent to use backhoes only if we were dealing with sites that appeared to be single component. The Lotus data were of critical value in this regard because cultural stratigraphy was often recognized only by inspecting tables and graphs showing vertical distributions of the artifacts.

In the end, this project required the simultaneous management of more than 40 people in the field, including three field crews, geomorphologists, palynologists, biologists, and other specialists. The only way we were able to successfully meet schedule and accomplish our research goals was through the use of computerized Critical Path Method (CPM) diagrams. CPM diagrams show the interrelationships between all team members and their activities. The diagrams also establish time frames

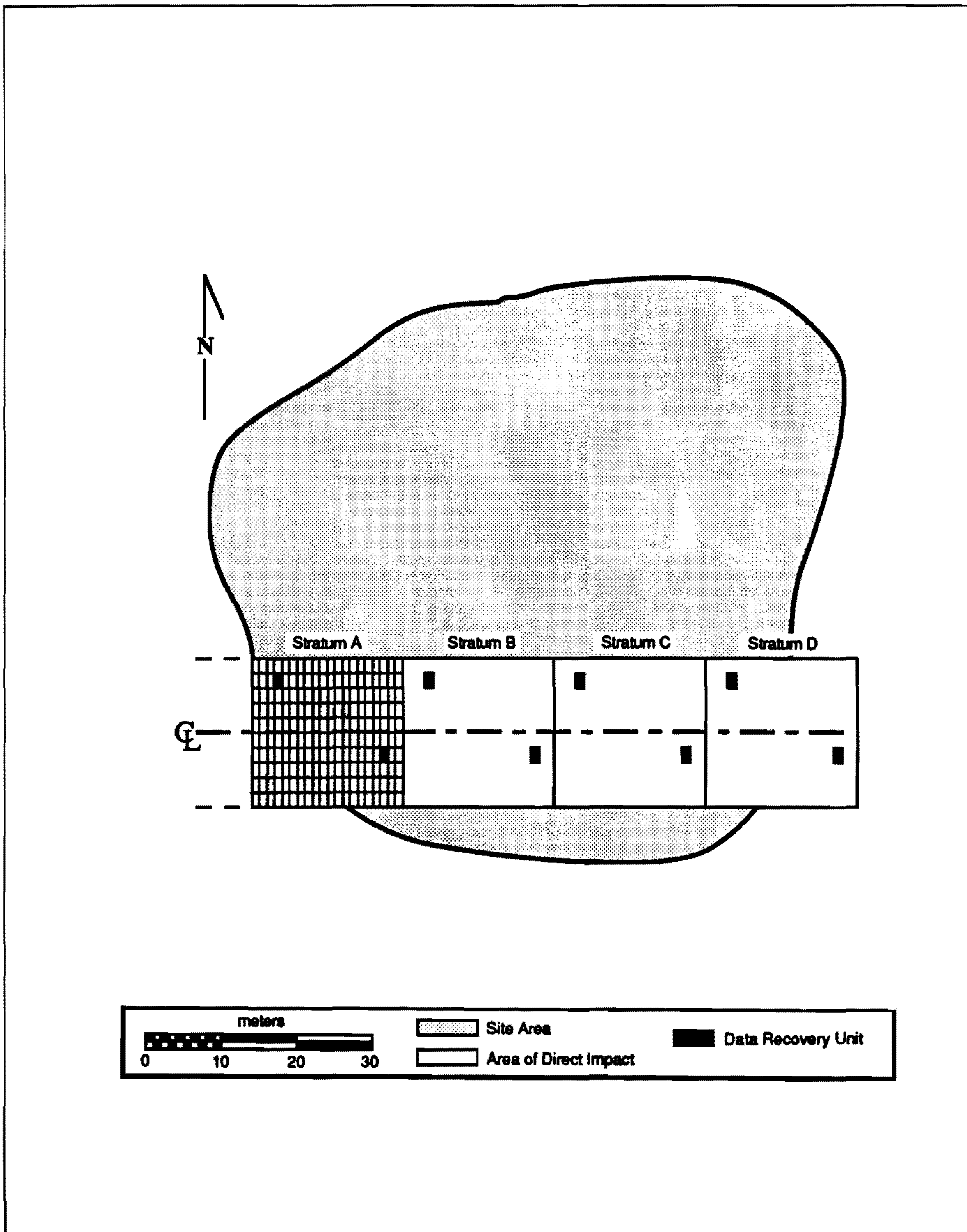

Figure 9. Generation of probabilistic excavation.

in which activities must be completed if schedules are to be met. Finally, CPMs allow the management staff to delegate accountability and task performance to specific team members. Specific work packages with defined procedures, inputs, and outputs are tied together in the CPM. Critical path methods are widely used in the business world to control large engineering projects, and they offer archaeologists similar benefits. Figure 10 illustrates a small segment of the overall project CPM which integrated the activities of three excavation crews, a monitoring crew, a large lab crew, an interdisciplinary team of specialists, the archaeological management team, Union Oil management, and construction personnel.

PROJECT STATUS AND PRELIMINARY RESULTS

The draft report on the project was completed in June of 1988. Although a peer review was not required by our contract, in the interest of producing the best report possible we submitted the draft to agency officials and several local archaeologists, including Michael Glassow. The last review was received in August 1989, and we expect to issue the final report in the near future (Woodman and Rudolph 1990).

Although we anticipate the next few months will result in refinement and modification of our thoughts on the data, some preliminary results are worth noting. First, relatively low artifact densities indicate most sites were occupied briefly but the presence of tools associated with a variety of activities suggests these encampments were occupied by small family groups. Most of these sites thus can be considered briefly occupied residential bases rather than locations or other types of limited activity sites (see Bamforth, this volume). Second, the types of lithic raw materials recovered from the sites indicate use by local groups. Use by groups from the interior (e.g., the Ynezeno) is not clearly indicated. Third, faunal remains suggest a mixed subsistence strategy with intersite differences reflecting minor variations in locally available species. Evidence for seasonality is scant but suggests late spring, summer, and fall occupations. There are at least two explanations of these findings. As Bamforth (this volume) notes, these sites may represent the seasonal dispersion of nearby village populations into small socio-economic groups subsisting on local resources during periods of food shortages. An alternative explanation suggested by ethnographic data is that many of these sites were established primarily for the gathering and subsequent transport back to the villages of seasonally available nuts and seeds. To determine which of these explanations is more likely, we are examining the resource structure of the environment, using theoretical data (e.g., Thomas 1983) to predict subsistence strategies, translating these strategies into archaeological expectations, and then comparing these expectations to data retrieved during the Union Project. We currently favor the explanation that many Union sites represent a foraging strategy based on encountering

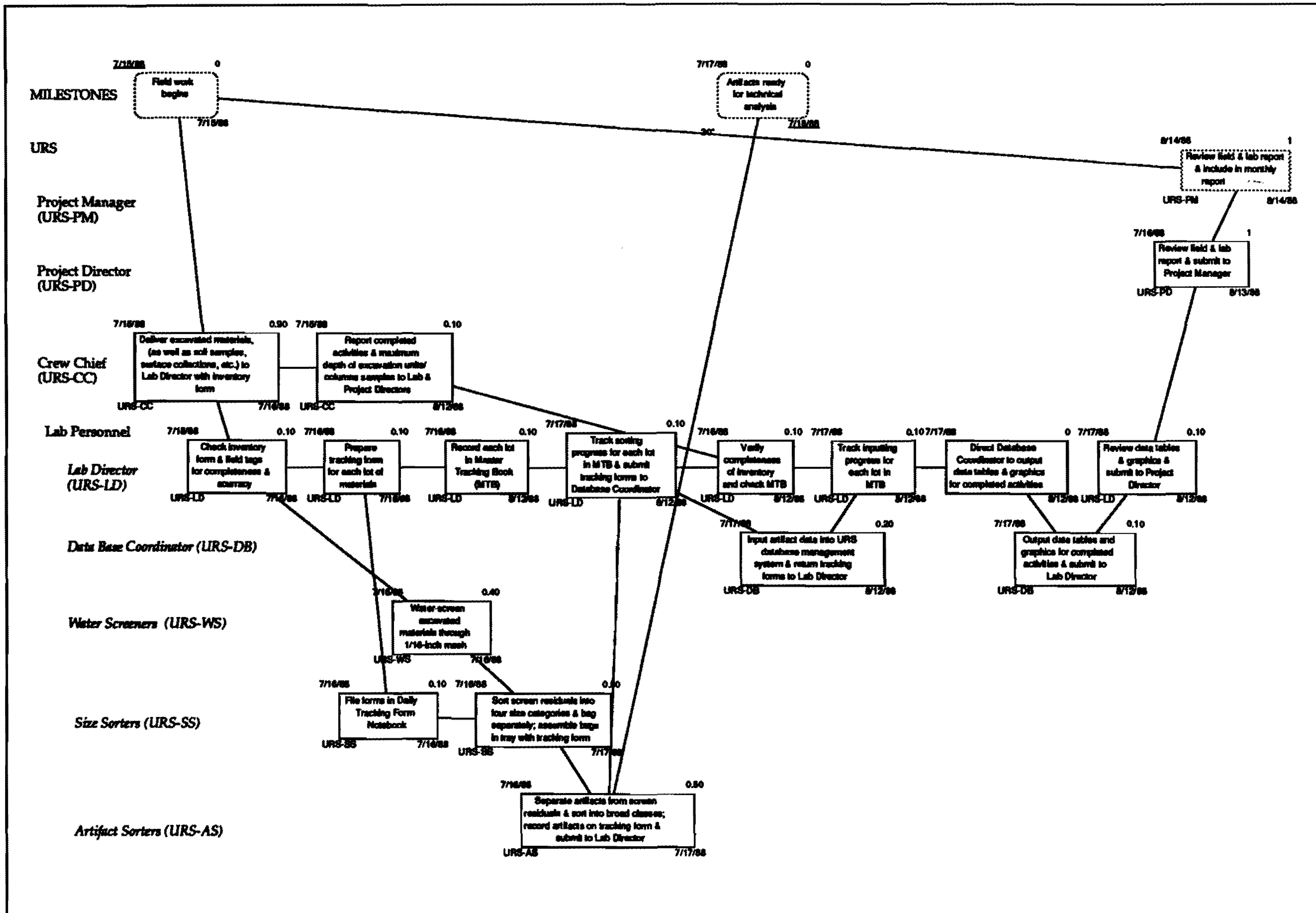

Figure 10. Typical critical path method (CPM) logic diagram: sequence of lab activities to produce data two days following excavation.

summer-ripening seeds that occur in low densities over a wide geographic area. The final report (Woodman and Rudolph 1990) will present a thorough discussion of this and other issues of concern.

The archaeological pattern noted above for Union Project sites in the lower Santa Ynez River basin is substantially different from that noted for the MX Project sites located on the San Antonio Terrace (Chambers Consultants and Planners 1984). Terrace sites appear to represent briefly occupied field camps and limited activity sites established primarily to procure deer and other animals for local villages. In contrast, Union sites appear more generalized in terms of activities represented in them and many were occupied for longer periods of time (although none of the Union sites were occupied for long and most were occupied for much less than a season).

Importantly, lithic raw material types recovered from MX and Union sites suggest that both project areas were used by local groups of people. Designing the Union Project to complement the MX Project has thus given us a much broader geographic understanding of prehistoric settlement and subsistence patterns in Purisimeno territory.

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