

DOLORS ARCHAEOLOGICAL PROGRAM TECHNICAL REPORTS

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The Dolores Archaeological Program Research Design

by

A. Kane, W. Lipe, R. Knudson, T. Kohler,
S. James, P. Hogan, and L. Sebastian

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Under the supervision of
David A. Breternitz, Senior Principal Investigator

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ABSTRACT

The U.S. Bureau of Reclamation original Dolores Cultural Resources Mitigation Program Request for Proposals specified development and submission of a research design as a requisite for potential contractors. The University of Colorado submitted a preliminary research design as part of its formal mitigation proposal to the bureau; this design underwent extensive revision in the fall of 1978 and spring of 1979. The document consists of 5 major elements or problem domains; these are economy and adaptation, paleodemography, social organization and settlement patterns, extraregional relationships and culture process. Each problem domain is presented as a structure of inquiry to address the major generalized questions. The problem domains as a whole are logically consistent and incorporate specific methodological guidance developed by the project staff. As the design is a structure of inquiry, it is not intended to answer all questions; rather, effort will be concentrated on those questions for which adequate data sets are available. The ultimate goals are to produce a reconstruction of synchronic prehistoric cultures and to develop and test a processual model using the research design as a methodological foundation.

INTRODUCTION

This document is the result of approximately one year of effort¹ devoted to elaborating and refining research strategies to be pursued in conjunction with the Dolores Archaeological Program (D.A.P.). In the original proposal to the Bureau of Reclamation (Spring, 1978), 5 problem domains were identified as the main elements of a research design. Each problem domain has evolved from relatively generalized questions, through a diagrammatic phase where the conceptual framework for research was developed, through a logical expression phase where the original questions were cast into a specific chronology of inquiries, to the present state in which each problem domain is expressed as an ordered series of specific questions for which viable analytical approaches using project data are available. The logic of each problem domain is consistent with that of all others and incorporates specific methodological guidance developed for this project.

This document consists of a discussion of general methodological consideration, followed by separate presentation of the 5 problem domains:

- Domain 1: Economy and Adaptation
- Domain 2: Paleodemography
- Domain 3: Social Organization and Settlement Patterns
- Domain 4: Extraregional Relationships
- Domain 5: Culture Process

¹This research design section was written in 1979 and has not been modified since then; it is the basic conceptual statement under which the D.A.P. prehistoric investigations operate.

The main orientation of Domains 1 through 4 is to produce synchronic descriptions of the Anasazi culture and its antecedents for each of several past time periods (temporal units). The orientation of Domain 5 is to produce diachronic description and explanations of culture, spanning several temporal units. Specific questions and strategies for Domain 5 are appropriately formulated at a later date when the synchronic descriptions from other domains begin to take form. Therefore, Domain 5 is expressed here as a relatively generalized logical construct; an implicit research activity in the coming year is to monitor the conceptual and analytical development of other domains and to advance Domain 5 to a higher level of specificity.

GENERAL METHODOLOGICAL CONSIDERATIONS

The Cultural Resources Mitigation Program of the Dolores Project provides unprecedented opportunities for enhancing public and scientific values through the large-scale interpretation of national heritage resources. The research design of the Dolores Archaeological Program recognizes the obligation to the public and to the scientific community to abide by a lucid, sound, replicable, and consistent set of methodological guidelines for the interpretation of data recovered in project operations. Important by-products of this orientation are a thoroughly documented record of project investigations and a rich and diverse data base, both of which could be useful to future anthropological research in the southwest.

General methodological considerations incorporated into this research design consist of a set of logical rules or research steps that structure the approach to each of the questions posed in each problem domain, along with some specific research activities for managing uncertainty and for improving the quality of inferences based on sample populations of data.

The set of logical rules is designed to lead each researcher through an identical process of theoretical development, library research, hypothetical formulation and testing, progressive inference (extrapolation, interpolation or patterning), and summarization. These rules apply to each question posed in the problem domains that follow.

1. Based on ethnographic, archaeological, and other scientific literature, identify models or logical constructs that may be used to describe the attributes or process under study. What are the relevant ways of organizing concepts? What are the data requirements of these models? What criteria are suggested for identifying the relevant attributes or concepts in the archaeological record?

2. Within the Escalante Sector, which of these models or constructs may be useful for describing the process or attribute under study? What specifically are the criteria for identifying the relevant data or concepts in the archaeological record in this area?
3. Express these models as hypotheses, and define test implications. Generally, we are speaking about multiple models or parametric models, and thus sets or ranges of test implications.
4. Test the hypotheses on excavation data (in most cases - some hypotheses are uniquely regional and are tested in the following steps). Identify which sets of test implications are satisfied, note the variability, and refine the model accordingly.
5. Develop test implications that are appropriate to regional level analysis, and extrapolate to survey site data. Identify which sets of test implications are satisfied, and note the variability.
6. Based on probability sampling and statistical inference, extrapolate to the unsurveyed portion of the Escalante Sector, and note the level of uncertainty.
7. Synthesize the results of study at the excavation site, survey site and regional levels, explicitly incorporating the uncertainty associated with each level of interpretation or inference. From this, produce a regional description of the attribute or process under study.

The researchers at D.A.P. recognize that many aspects of archaeological research, particularly those that aspire to regional interpretations, are attended by uncertainty. Some of this uncertainty is inherent in the nature of the work, and some is structural within the methodology (perception and inference). In order to manage uncertainty, we have incorporated into the research program specific activities to control or quantify variability, probability, and levels of confidence in our investigation. We recognize that we are dealing with incomplete data, and will propose studies to examine the recovery of information in excavation sites and survey sites. Sampling studies (discussed below) will also be proposed to enhance our understanding of the representativeness of data that we collect. Another inherent source of uncertainty is physical disturbance in the archaeological record. In addition to recording and

accounting for disturbance in our field studies, we will propose studies to examine the causes and effects of disturbance in the sites we dig. Structural uncertainty (related to sequential inference and variability in the perception of archaeological remains) will be addressed explicitly. We hope to control perception by rigorously establishing criteria for identifying objects, assemblages, processes and concepts in the archaeological record. We hope to control inference by the strict application of axioms of probability theory, and possibly through the use of Bayesian statistics. Wherever appropriate and relevant, objective or subjective expressions of the level of confidence or a probability distribution will be attached to observations and interpretations of data. To the extent possible, all analytical approaches will include assessments of variability and systematic treatment of uncertainty.

Many inferences will be based on the study of sample population. We will propose a set of studies and experiments to increase the representativeness of sample populations to the sampling universe and to enhance the recovery of data important to the research design. Tentatively, we envision sampling studies or experiments to illuminate the study of occupation surfaces, surface recovery on survey sites, and regional site sampling. In addition, we have put into use a convention for probability sampling of all data on excavation sites, with the intent of providing a uniform basis for inference and extrapolation in the several problem domains.

PROBLEM DOMAIN 1: ECONOMY AND ADAPTATIONS

GENERAL LOGIC: Within each temporal unit, what were the available resources; which ones were used by prehistoric peoples, how did they use (technically) each resource; how were these individual resource-use techniques combined to form subsistence systems, and what were the basic social organizational attributes of these systems? The intent here is to describe the paleoenvironment and its prehistoric human usage, as well as to provide input to Problem Domains 2-5.

QUESTION 1: WHAT RESOURCES WERE AVAILABLE IN THE AREA, IN EACH TEMPORAL UNIT?

- 1a: Explicitly identify those natural resources considered to be of real or potential cultural significance within the D.A.P., and outline the basis for that evaluation.
- 1b: Which of these resources are now present within the project area, or were present there historically?
- 1c: Which resources were used by indigenous people, according to ethnographic and/or ethnohistoric records?
- 1d: What resources were present in the D.A.P. within each temporal unit?
- 1e: What were the absolute and relative abundances of these resources, and what was their spatial distribution?
- 1f: Based on all of the above, what resources were culturally available to prehistoric D.A.P. peoples?

QUESTION 2: WITHIN EACH TEMPORAL UNIT, WHICH RESOURCES WERE USED BY PREHISTORIC PEOPLE?

- 2a: What is the archaeological evidence for the composition of the used resource base?
- 2b: What is the ethnographic, ethnohistoric, and regional archaeological (controlled for level of inference) evidence for modeling the used D.A.P. resource base?

- 2c: What then is the inferred composition of the D.A.P. resource base within each temporal unit? What materials were used, in what quantities, and from which sources?
- 2d: What proportion of the available resources were not used within any temporal unit? List these and offer alternative suggestions as to why these were not exploited.

QUESTION 3: HOW WERE EACH OF THESE RESOURCES USED, AGAIN WITHIN EACH TEMPORAL UNIT?

- 3a: Based on the list of used resources identified in Question 2, what archaeological contextual information is associated with each resource?
- 3b: Reviewing comparable ethnographic, ethnohistoric, experimental, and regional archaeological descriptions of these identified resources,
- (1) What perishable items are frequently associated with each resource?
 - (2) What are associated contexts, noting variations in such associations?
 - (3) What various activities or behaviors (as relate to resource procurement, processing, storage, distribution, consumption, discard) are associated with these resources and their contexts?
 - (4) Based on all this information, develop models of expected usage patterns and their predicted archaeological residues for various resources, i.e., explicitly define test implications of usage behavior models.
- 3c: Given the archaeological data, models of expected resource use activities, and test implications of those models, define adaptive techniques and strategies for all used resources for each temporal unit.

A basic paradigm for this can be presented in tabular form, understanding that it is a generalized view of resource use and that ultimately the answer to Question 3 must (insofar as is possible) be a species-by-species description of techniques and strategies.

Tasks ^b	Resource use techniques and strategies ²					
	Biotic resources ^c		Abiotic resources ^c			Composite ^c resources
	Plant	Animal	Rock	Soil	Water	
Procurement						
Processing						
Storage						
Distribution						
Consumption						
Discard						

^aFilling out this chart is initially a listing of activities, not a discussion of their systemic organization.

^bFor some resource-use strategies it may not be appropriate to fill in each task cell; however, that should be explicitly thought out.

^cMany resources become combined with another to form a culturally significant product, e.g., corn and venison together form stew, a stone point with wooden shaft and sinew binding is a spear. Individual elements within each of these composite entities should have their individual life histories outlined in this table, with appropriate cross-references, and then the life history of composite items also should be displayed (though with most of the detail only referenced to elsewhere in the table).

As an example of how one might go about filling out this table, the following questions about plant uses are outlined. Be sure in answering these queries to specify whether you are dealing with known or inferred data. These questions should first be answered for individual species, and then for plants as a general class.

- (1) How were plants procured?
 - (a) Where did they come from?
 - (b) How are they available (considering the environmental constraints)? How much was used?
 - (c) What tools, facilities, and techniques were used to procure them?

- (d) What seasonal patterns of plant procurement are evident?
 - (e) What is the minimum and maximum task group size appropriate for acquisition of this kind and quantity of plant resource?
 - (f) How many plants were discarded after procurement without any other use?
- (2) How were plants processed?
- (a) Where were they processed?
 - (b) What tools, facilities, and techniques were used to process them?
 - (c) Why were plants processed—for biochemical reasons, for tool-making, or what else?
 - (d) What seasonal patterns of plant processing are present?
 - (e) What is the minimum and maximum task group size appropriate for processing this kind and quantity of plant resource?
 - (f) Of what was procured, how much was processed? How much of what was processed was discarded without further use?
- (3) How were these plants stored?
- (a) Given the need for storage, what biochemical constraints operated to limit the kinds of items stored?
 - (b) Which plants were stored?
 - (c) Where were they stored, and what tools, facilities, and techniques were used to store them?
 - (d) What seasonal patterns of plant storage are evident?
 - (e) What is the minimum and maximum task group size appropriate for storing this kind and quantity of plant resource?
 - (f) Of what was procured, how much was stored? Of what was processed, how much was stored? How much of what was stored was discarded without further use?
- (4) How were the plants distributed?
- (a) What were the constraints to distribution?
 - (b) Which products were distributed, and from where to where?

- (c) What tools, facilities, and techniques were used to distribute these products?
 - (d) What seasonal patterns of plant distribution are present?
 - (e) What is the minimum and maximum task group size appropriate for distributing this kind and quantity of plant resource?
 - (f) Of what was procured, how much was distributed? How much of this was processed and/or stored? How much of what was distributed was lost without any other consumption?
- (5) How were these plants consumed?
- (a) What plants were used in which consumptive mode (not including discard)?
 - (i) food
 - (ii) building material
 - (iii) tools, facilities (inc. baskets)
 - (iv) clothing, inc. sandals
 - (v) ceremonial purposes
 - (vi) medicinal purposes
 - (vii) fuel
 - (viii) trade, out of the system
 - (b) Where were the plants consumed, again specifying consumptive mode?
 - (c) What tools, facilities, and techniques were used for plant consumption, specifying modes of the latter?
 - (d) What is the appropriate minimum and maximum social unit of consumption, specifying resources and consumptive mode?
 - (e) What seasonal patterns of consumption are evident?
 - (f) How much of the procured plants were consumed? Of what was consumed, how much had been processed, stored, and/or distributed?
- (6) How were the collected plants and plant products discarded?
- (a) What were the modes of discard (e.g., loss, abandonment, re-use)?
 - (b) Where were things discarded?
 - (c) Why were some things discarded, others reused?

- (d) For each reused item, describe how, where, and when it re-enters the cultural system of use.
 - (e) What, if any, tools, facilities, and techniques were used in the process of plant discard?
 - (f) What seasonal patterns of plant discard are evident?
 - (g) What is the appropriate minimum and maximum social unit of discard?
 - (h) How much of the procured plants were discarded before processing? After processing, but before storage and/or distribution?
- 3d: Given all the above task descriptions, how are these tasks organized and/or scheduled to form strategies of specific resource use? Describe in terms of work-time or energy investment in the entire strategy, as well as in its component tasks.

QUESTION 4: WITHIN EACH TEMPORAL UNIT, HOW ARE THE TASKS AND STRATEGIES OF RESOURCE EXPLOITATION ORGANIZED TO FORM A SUBSISTENCE SYSTEM TO MEET BASIC SOCIAL AND CULTURAL NEEDS?

Again, this question is best answered by displaying subsistence system components and subsystems in tabular form, then filling in specific cells of descriptive information to be able finally to characterize the entire dynamic system.

		Systemic Components					
		Structure			Function		
		Natural resources	Environmental constraints	Human management needs	Technology (tools, information)	Activities (tasks, strategies)	Scheduling
Subsystems							
Tools, facilities							
Food	Domestic						
	Wild						
Shelter							
Clothing							
Socio-genic	Sociotechnic						
	Ideotechnic						

In this table, questions are best organized by rows, i.e., to define subsystems. For example, to define a food subsystem, one would ask:

- 4a: What natural resources are used as food, identifying (1) domestic and (2) non-domestic elements? Specify animal vs. vegetable populations, including genera and/or species.
- 4b: What environmental constraints (e.g., climate, soil chemistry) are there to food production (including both domestication and natural production)?
- 4c: What needs of human individuals and social groups constrain the kinds or quantities of resources used as food?
- 4e: What human activities are involved in the procurement, processing, storage, distribution, consumption, and discard of this food?
- 4f: What seasonal or annual patterns of scheduling has the prehistoric human society developed to provide food for their needs?

QUESTION 5: WHAT WERE THE BASIC SOCIAL ORGANIZATIONAL ATTRIBUTES OF THE SUBSISTENCE SYSTEMS IDENTIFIED FOR EACH TEMPORAL UNIT?

- 5a: What were the minimum and maximum number of people appropriate for each activity and task?

- 5b: How were the people organized to perform these activities?
- 5c: What was the functional division of labor appropriate for the described tasks and subsistence sub-systems (by sex, age, and social status)?
- 5d: What spatial considerations were involved in the social organization of individual and groups to operate these subsistence sub-systems and their component tasks?
- N.B. Information from all of the above questions, including individual data elements and inferred systemic descriptions, serve as data in answering questions in Problem Domains, 2, 3, 4, and 5.

PROBLEM DOMAIN 2: PALEODEMOGRAPHY

GENERAL LOGIC: How many people lived in the Escalante Sector in each temporal unit? How many people were associated with each household, with inter-household groups, and with each site? What were the characteristics of this population (age, sex, health)? How were they distributed? How do these population estimates and distributions compare with the theoretical maximum limits to the number of people that might have lived in the area at different times?

The main tasks here are estimation of a vanished population in several past temporal units, and compilation of sufficient data (demographic and other) for use in a simulation of population growth and distribution (development of the simulation model is discussed in relation to Problem Domain 5 - Culture Process). To estimate the prehistoric population, three kinds of estimation methods will be used:

1. Habitation studies
2. Resource-based studies (carrying capacity)
3. Time-rate studies (rate of accumulation of archaeological evidence over time.

For each of these estimation methods, alternative approaches and models will be explored. Characteristic steps in the development of each alternative approach or model for a population estimation method are:

1. Based on a review of literature, selection of one or more ethnographic or other-archaeological models of the process or attribute under study (e.g., household size, resource use, artifact discard, population growth)
2. Examination of excavation data, based on established criteria for identifying or interpreting the archaeological evidence in relation to the concepts required by the models

3. Extrapolation to survey data and unsurveyed portions of the Escalante Sector, based on several alternative indicator attributes (e.g., site size, site type, artifact distributions and densities, etc.), as well as on statistical methods
4. Based on the above steps, estimation of total population at a site during a temporal unit. Concurrently, development and use of a technique to distribute this total population over the span of a temporal unit, to allow for an estimate of momentary population at any point during a temporal unit.

Ancillary to each approach to population estimation is the choice and refinement of methods to provide chronological controls, to define occupation episodes that may be assigned to specific temporal units.

The characteristics of the population in each temporal unit will be estimated on the basis of human skeletal remains and statistical inference. Currently planned mitigation activities are not expected to yield a large number of skeletons. In the absence of sufficient direct evidence (human bones) a very conservative approach will be used for estimating demographic characteristics (such as age and sex composition, and health). Most of the interpretive demographic data developed on the basis of limited direct evidence will not be generalized beyond the hamlet or site level.

The studies of population distribution will rely on momentary population estimates and chronological controls for each occupation site. Optimally, for each occupation site encountered in the Escalante Sector, a time, spatial dimension, range of total population and a level of confidence in the estimate will be developed. These data will be used as direct inputs to demographic simulations planned for Problem Domain 5.

QUESTION 1: HOW MANY PEOPLE LIVED IN THE ESCALANTE SECTOR IN EACH TEMPORAL UNIT?

No single estimation techniques relying on incomplete data can produce a confident prehistoric population estimate. Therefore, three

different approaches, each utilizing different kinds of data, will be pursued and the results compared to yield a synthetic and relatively high confidence "best estimate".

1a: (Habitation Approach) Based on ethnographic and archaeological models of household size and household-site size correlation and variability, estimate the maximum cumulative population by multiplying the number of households from each temporal unit at a site by a range of household sizes (a variation of this is to estimate the habitation area, and multiply this by a ratio of habitation area-to-population). Then, distribute this cumulative population over the temporal unit (using a range of assumptions and chronological evidence) to develop the ability to estimate momentary population at any time interval in the temporal unit. Specific questions pertinent to this approach are:

- (1) From the literature (ethnography and archaeology):
 - (a) What are the criteria for identifying a household in the archaeological record?
 - (b) What correlations are suggested between the spatial dimensions of architecture, activity loci, associated features, and household size? What correlations are suggested between site size and number of households? How do these relationships vary?
 - (c) What are the criteria for identifying temporal units at occupation sites? What correlations are suggested between surface features of sites and the depth, complexity and chronology of underlying deposits? How do these relationships vary?
- (2) What test implications can be developed to identify households and household sizes on the basis of the above models? What implications can be developed to identify or predict evidence of temporality on the basis of the above models?
- (3) Based on excavation data and probabilistic estimation methods, how many households from each temporal unit occur at excavation sites? Are these household number estimates consistent with the models from (1) (above)?

(4) Based on excavation data and probabilistic estimation methods, what are the surface indicators of occupation during each of several temporal units? Using surface observations from survey sites, what are the temporal units likely to have been spanned by occupations at each site?

(5) Using site size-household number correlations (or other defensible relationships) developed from steps (1) through (3) (above), extrapolate to survey sites to yield an estimate of the number of households at each survey site (occupation sites only), by temporal unit.

(6) How do the locations of sites surveyed to date compare with an idealized probabilistic sample of site locations for the Escalante Sector: The research purpose of this examination is to place a momentary confidence interval about the extrapolation of household numbers and temporal units from excavated to survey sites, and to provide the basis for further extrapolation to unsurveyed areas.

(7) Based on probabilistic estimation techniques and explicit treatment of uncertainty, how many sites of what size and temporal unit are likely to have been occupied in unsurveyed portions of the Escalante Sector?

(8) Based on household size estimates (from the literature and excavation data); on household number estimates from excavated sites, survey sites and unsurveyed areas; and on explicit expressions of uncertainty associated with each level of estimation-extrapolation, how many people are thought to have lived in the Escalante Sector in each temporal unit? At each site?

1b: (Resource-Based Studies) Based on ethnographic and other-archaeological models of subsistence systems and their variability, and on environmental data from the area, estimate the theoretical maximum number of people that could have been sustained by the resources available in the Escalante Sector. Alternative approaches to this could include multiple-resource models, indicator (single resource) models, decision-based models, or others. Based on excavation data, develop estimates of resource use at sites; extrapolate these estimates to survey sites and unsurveyed areas to produce a regional resource use estimate. Compare resource use to resource availability, and compare this ratio to

ethnographic and archaeological models to yield a resource-use-based population estimate for each temporal unit. More specific questions pertaining to this approach have yet to be elaborated, depending on the choice of models. The following attempts at a more specific logical context within which an orderly sequence of steps can be postulated and adapted to fit the chosen model or models.

Conceptually, a three-element model construct is needed. For the hunter-gatherer cultural period a non-domesticated-foraging resource-use model will be developed. For sedentary cultural periods, separate models for domesticated and non-domesticated resource use will be developed, and then combined. The hunter-gatherer-only and the sedentary-nondomesticated resource models will be used primarily for bounding purposes. The main effort will focus on developing a resource-use model centered around agricultural crop yields. Overall, such a model seeks to estimate total possible agricultural yields, identify agricultural resource use at sites, estimate limits to agricultural resource use at sites, examine these limits in relation to total possible production limits in the Escalante Sector, and infer from this proportion a maximum population in each temporal unit.

Controlling conditions in such a model are likely to be: soil nutrients, and their rate of depletion under agriculture, available technology (clearing, tilling, etc.), and available moisture. Specifications of these conditions will come from the literature and from Problem Domain 1 studies. Subject to these conditions, a land-suitability model and map will be developed. Probable components of the suitability model are: fertility, friability, cover, moisture content (depth, water retention, warmth, drainage, slope, aspect), and seasonal constraints.

Products of the model will be descriptions of crop type, yields, and soil depletion rates at specific locations. Crop yield data from experimental gardens will provide a basis for comparison and adjustment of model components and products.

The products of such a model can be used to generate site-specific test implications of resource-use hypotheses involving presence-absence or increasing-decreasing utilization of domesticated food resources in each temporal unit. Gross crop yield and soil depletion estimates can be used to describe theoretical maximum population ranges that could have been sustained by domesticated resources in each temporal unit. These values may be adjusted to account for non-domesticated food resource use and then further adjusted by the subsequent development and application of models that are based on decision rules (agricultural site preference) or food production and processing technology limits. Construction of these models would rely heavily on ethnographic analogies and implementation of the models would require examination and statistical manipulation of excavation and survey data. The adjusted maximum population estimates would then be disaggregated to the site level (if possible), and reaggregated over sites within each temporal unit to produce sector-wide synchronic population estimates.

1c: (Time-Rate Studies) Using a combination of ethnographic and archaeological models and additional experimental/simulation efforts to postulate the rate of deposition and/or discard of various kinds of archaeological evidence on different kinds of surfaces, develop a model of accumulation of evidence over time in relation to human effort and population size. Based on excavation data (samples), estimate the total quantities of selected diagnostic archaeological evidence deposited in

excavated sites in the Escalante Sector in each temporal unit. Compare the quantity of evidence likely to have been deposited to the human effort likely to have been required to deposit that quantity to infer a level of human activity associated with occupation at each site in each temporal unit. Divide or proportion the level of activity by the length of the associated temporal unit to infer a population size at each site for each temporal unit. Concurrently, seek out a correlation between visible attributes of survey sites (e.g., surface artifacts, architecture, features) and quantities of deposited artifacts. Identify the temporal units during which each survey site was likely to have been occupied. Apply the model developed in excavated sites to survey sites in order to estimate population size in each temporal unit. Based on a comparison with a regional sampling construct, estimate the total population in the Escalante Sector in each temporal unit. Utilizing the deposition/discard-rate model, develop a statistical formula for estimating momentary population at the site and sector level.

A special case of the time-rate study is the survivorship model, based on human burial data. Conceptually, age, sex and fertility observations from excavated human skeletons are systematically compiled until a skeletal population of sufficient size (i.e., more than 100 to several hundred) is assembled and described for a given temporal unit. Life tables and a beginning population estimate (from other sources) are then prepared and used as inputs to a simple arithmetic survivorship model which over the short run can provide momentary population estimates within a temporal unit. In a diachronic application (more appropriately the subject matter of Problem Domain 5), assumptions regarding migration are incorporated into the model along with other constraints that influence

mortality and fertility. It is unlikely that a sufficient number of skeletons will be excavated in the near term; without a large number of skeletons, construction of such a model would not be merited. No specific research design along these lines will be proposed until enough data are accumulated to permit an explicit treatment of variability and uncertainty in the human bone record.

QUESTION 2: HOW MANY PEOPLE WERE ASSOCIATED WITH EACH HOUSEHOLD, WITH INTERHOUSEHOLD GROUPS, AND WITH EACH SITE?

- 2a: What does the ethnographic-archaeological literature suggest are the criteria for identifying households (from Question 1a: (1)(a)). Interhousehold groups?
- 2b: What does the literature suggest are the indicators of household size? What are the criteria for identifying these indicators in the archaeological record (from Question 1a: (1)(b) and (2))?
- 2c: Based on excavation data and the above models, how many people were associated with each excavated household and each excavated interhousehold use area? How many people were associated with each site (from Question 1a: (7))? What are the associated uncertainties in these estimates?
- 2d: Based on statistical examination of these excavation-based estimates, what are the measures of central tendency and variability for household size and interhousehold group size? These interpretations are to be organized by site and temporal unit.

QUESTION 3: WHAT WERE THE CHARACTERISTICS OF THE POPULATION IN EACH TEMPORAL UNIT?

Like the survivorship model discussed earlier under Question 1c, studies of demographic characteristics generally require a large body of skeletal data to achieve acceptable levels of significance. Until a sufficient body of data is accumulated, approaches to this question will be limited to the systematic compilation of data from excavated human remains, and general comparisons of these data with other skeletal populations from the Northern San Juan Area. Early studies of age and sex will simply record these attributes for individuals until a statistically

manageable sample is accumulated. Health studies will initially be limited to an examination of oral pathology (frequency, type: antemortem tooth loss, caries, and periodontal abscess), based on the assumption that these observations may be presumed to indicate the health of the entire organism. These observations may then be compared with characteristics of other skeletal populations from the area to make some general inferential statements about human health in the Escalante Sector. If and when a large skeletal population is excavated, a more detailed and rigorous research design for specifying demographic characteristics will be proposed.

QUESTION 4: HOW WAS THE PREHISTORIC POPULATION DISTRIBUTED?

Inputs to this question are derived wholly from the answers to Question 1. The main purpose of responding to this question is to generate a systematic set of data for studying variation in distribution, in Problem Domain 5. The pertinent subquestions are:

- 4a: What are the locations of human occupation in each temporal unit? Which locations were permanently occupied? Which ones were seasonally occupied?
- 4b: How many people occupied each location?
- 4c: What are the approximate dates of each occupation?
- 4d: What does the literature suggest are limits to site size and proximity, in relation to site type and temporality? How do Escalante Sector sites compare to these limits, in each temporal unit? What is the variability?
- 4e: From the literature what are the available models to describe site distributions by size and type for formative cultures? For earlier periods? What models are available to describe human distributions (density per household, per square kilometer, distribution with respect to natural resources, etc.)? Do any of these models seem to be consistent with observed distributions in the Escalante Sector. If so, what is the nature of the variance between expected and observed distributions?

QUESTION 5: WHAT ARE THE IMPLICATIONS OF THE PRODUCTS OF THIS PROBLEM DOMAIN TO OTHER PROBLEM DOMAINS?

This is a methodological problem, but should be formally addressed to maintain consistency between analyses of different domains. Many of the questions that are the main subject matter of Problem Domain 2 (such as household size, site size, distribution of people with respect to available resources, etc.) are influential in developing assumptions for other problem domains, prominently Problem Domain 3 - Social Organization. Since the overall approach proposed here has been to generate multiple models and compare results to yield "best estimates", the variability among intermediate analytical results from this domain merits examination in relation to the strength and validity of assumptions that may be developed out of these data for use in other research areas. The techniques to be used to respond to this question will vary with the degree of consistency or inconsistency of intermediate results from alternative models used in this problem domain. Initially, variance among analytical results will be examined statistically towards the specification of error and confidence limits. If extreme or antithetical inconsistencies occur (such as a carrying-capacity-based population estimate that is lower than the habitation-based estimate), then restructuring of this or other problem domains may be indicated.

PROBLEM DOMAIN 3: SOCIAL ORGANIZATION

Because of the broad range of information encompassed by this problem domain, we have chosen to divide it into four aspects or subdomains: social, economic, political, and ideological/ceremonial. Settlement patterning, originally a component of this study area, is no longer considered a separate area of inquiry, but rather as a type of evidence on which the subdomains of this problem domains and other problem domains draw. The divisions listed above were derived largely out of convenience; however, the separation follows traditional lines of anthropological inquiry. We fully recognize that these divisions are artificial, and probably do not parallel cognized divisions of the culture under study.

Essentially, research in each subdomain will pursue independent, though not unrelated, lines of evidence. Subdomain 1, social organization, has as its major focus the identification of groups - those units that structure the society's social relations. We are assuming here that the Anasazi culture was a kin-based society. The structure identified in this subdomain, therefore, is expected to serve, as does the kinships system, as the basis of organization for all of the society's activities.

The subdomains addressing the economic and political aspects of social organization, on the other hand, are functional divisions. The units participating in these types of activities, therefore, can be expected to be subsets of the social groupings identified by subdomain I. Similarly, subdomain 4 must ultimately be related to these groups. This division, however, is neither a structural nor a functional one. Rather, ideology as reflected in the archaeological record through ceremonialism,

is seen as a pervading mechanism for social integration, sanction of authority, and possibly, for the organization of certain economic pursuits.

Because they pursue largely distinct lines of evidence, research in each of the four subdomains can be pursued concurrently. Subdomain 3, political organization, though, is based largely on the analysis of patterns derived from more primary data by the other three subdomains. Consequently, the full range of research into this aspect of social organization must await some preliminary work in the other areas. Similarly, certain questions in other subdomains cannot be completed until there is input from research in other problem domains. Notably, questions relating to group size in subdomain 1, and to the means of production in subdomain 2 are dependent upon prior work in problem domains 2 and 1 respectively.

Problem Domain 3, Subdomain 1: Social Organization

Service [1:17] divides the structure of social organization into groups, the small social units into which societies are divided, and statuses, "named social positions which are assigned conventional attributes and roles that regulate or influence the conduct of interpersonal relations." Thus defined, a status network is highly emic and would appear largely unrecoverable archaeologically. But it is important to keep in mind that status networks "regulate and influence" interpersonal relations through sets of rules of conduct. Such sets of rules should produce patterned behaviors, at least some of which should have archaeologically recoverable material correlates.

Generally speaking, however, it is the groups aspect of social structure which will be more readily and completely identifiable archaeologically. Service further divides groups into those which are residential and those which are "a nonresidential association that has some corporate functions or purposes" (Service [1:13]), the latter of which he terms "socialities."

If we turn from this brief sketch of the structure of human social organization to a consideration of its function, we might accept the following as a working definition. Social organization comprises those aspects of culture which serve as:

. . . the extrasomatic means of articulating individuals one with another into cohesive groups capable of efficiently maintaining themselves and of manipulating technology (Binford [2:219]).

This maintenance of the group involves both biological continuance and such social factors as socialization and enculturation of children. As for effectiveness, White ([3:103]) describes the effectiveness of a social unit as arising from the group's size and its solidarity, "the strength and intensity of the ties, the social relations, between the individuals who compose the group." These two competing forces, inversely related to each other, ultimately determine the nature of a society's social organization. The size of social groups, the degree of integration of the groups, and the changes in these two factors through time are potentially informative about the effectiveness of social units and about the response of social units to various stresses.

The three major areas of concern in this subdomain, therefore, are the delimitation of groups, both residential and nonresidential; the identification of archaeologically recoverable information about the status network; and the study of group solidarity or integration.

The identification of groups at all hierarchical levels - from the socio-economic household to the largest ethnically self-conscious entity - should be the central concern of the social organization subdomain. Architectural evidence should be especially important at the household, household cluster, and village levels of social groupings. Stylistic evidence would be equally important at these levels and supremely important at the locality, sector, and district levels. Settlement pattern data would be critically important to any understanding of the relationship between various hierarchical levels of residential groups and perhaps to the definition of nonresidential associations as well.

The network of statuses in a society would, as noted above, be much more difficult to recover archaeologically. Such macro-level status positions as men vs. women or various age-grades may well show evidence of differential rules of behavior in terms of division of labor, styles of personal adornment, mortuary treatment, etc., but the micro-levels are less given to material correlates. An example of a possible line of evidence which might be productive in studies of finer status distinctions would be differential distribution of animal carcass parts which might imply specific rules of food sharing tied to specific kin relationships, but such inferences would be tenuous at best.

Unlike boundaries of groups and the named positions of the status network, both of which are discrete units having direct material culture correlates, the integration of social groups is a relative attribute which must be inferred from less direct material evidence. There is no one best material culture measure of increased or decreased intensity of social relations; the most suitable measure will vary with the nature of the available data and with the exact questions about integration which are

being asked. Some measures of integration which have been used include degree of sharing of stylistic elements, standardization in the manufacturing or construction techniques, and physical proximity or access to specific physical facilities.

Though strongly inferential, the evidence for degree of integration is probably more direct than the evidence for means of integration. An increase of group integration was undoubtedly one of the latent functions of many groups and activities in Anasazi life, but these groups and activities had manifest functions (most of them involving other problem domains or subdomains) which would have been perceived as the primary or sole functions of the groups or activities in question. And more important, those manifest functions would have left most or all of the recoverable material culture remains. Only by analogy with manifest and latent functions of ethnographically known groups and activities can we approach the question of means of integration.

The three major areas of concern identified above - social groups, the status network, and the integration of social units - may be used to structure sets of specific questions to be pursued within the D.A.P. research design. This list of questions should not by any means be considered exhaustive; rather it should be considered as setting out general lines of inquiry and suggesting a number of potentially fruitful specific problem areas.

QUESTION 1: WHAT SOCIAL GROUPS CAN BE DEFINED WITHIN THE STUDY AREA?

1a: What residential groups can be identified?

(1) Can residential groups smaller than the site as a whole be identified?

- (2) Can residential groups intermediate in size between presumable domestic socio-economic units and the site as a whole be defined?
- (3) Is there more than one hierarchical level of intermediate groups?
- (4) Are the numbers and types of hierarchical levels the same at all sites of comparable size and time? If not, is there a patterned difference in numbers of levels at various locations within the project area?
- (5) What can be determined about the relationship of larger residential groups to smaller groups in general and to specific smaller groups (or sets of groups) in particular?
- (6) What can be determined about the relationship between residential groups at the same hierarchical level?

1b: What nonresidential groups can be identified?

- (1) Can any evidence be adduced of ethnic self-awareness roughly corresponding to locality, sector, district, region, or other spatial divisions used in this project?
- (2) Is there evidence for a hierarchy of nonresidential associations, with members, for example, from several hamlets or villages or even from several larger spatial units such as localities or sectors?
- (3) Within villages or hamlets, is there evidence for nonresidential associations which cross-cut residential boundaries?

QUESTION 2: IS THERE ARCHAEOLOGICALLY RECOVERABLE EVIDENCE OF WHAT SERVICE TERMS THE STATUS NETWORK?

2a: What can be determined about the roles of status positions?

- (1) What can be determined about such macro-level status positions as man, woman, immature individual, mature individual, old person, etc.?
- (2) Can anything be determined about micro-level statuses?

QUESTION 3: WHAT INFORMATION ABOUT GROUP INTEGRATION CAN BE RECOVERED ARCHAEOLOGICALLY?

3a: What degree of integration can be postulated for residential and nonresidential groups in the Project area?

- (1) What material remains can be considered indicative of degree of group integration?

(2) How can degree of integration be measured?

(3) Are there apparent differences in degree of integration between groups at different hierarchical levels? At the same level within the same site? At the same hierarchical level in different geographical locations?

3b: What evidence is there of means by which group integration was maintained and increased?

(1) Do the means of integration appear to have been specific to particular hierarchical levels?

(2) Do the means of integration appear to have varied geographically?

Problem Domain 3, Subdomain 2: Economic Social Organization

Economic social organization comprises the social relations of production, distribution, and consumption. Although closely allied with Problem Domain 1, subdomain 2 is distinct in emphasizing the interplay of information and materials that move goods through the society rather than the technological factors related to that flow. In general, the goal of research is to identify the units of production, distribution, and consumption for each major class of material goods, and to relate those units to the social groupings that organize the Anasazi culture.

Unlike the other subdomains of social organization, this subdomain will derive its basic data from the lowest order of the spatial hierarchy, the activity locus. Initially, the objective is to reconstruct which activities were performed and where they were habitually carried out. Secondly, the number of participants and the status of those performing the task must be inferred. Finally, each task group and each locus of activity must be tied to the spatial correlates of the social groupings identified in subdomain 1.

An additional concern is how to best classify material goods for analysis. Precisely, what constitutes a "major class of material goods" will clearly vary with the specific study, but in general, the focus in classification will be on the process of consumption. Were the materials consumed as food, fuel, building materials, or as the raw materials for a particular industry? Further division of these categories might then be made based upon the character of the materials themselves. Other distinctions that might prove useful are between perishable and durable goods, materials available locally and those that are exotic, materials that are perennially available and those cyclically available, and between goods produced for consumption and those for exchange.

At the level of the activity locus, primary evidence will be those attributes of artifacts related to function, and those that denote some particular social status. Proximity to a particular resource and botanical and zoological remains will also be considered as evidence. Analysis at higher spatial divisions will probably be more synthetic, with a greater reliance on contextural association, differential distribution, and variability. It is anticipated that this will involve a variable battery of statistical tests, locational analysis techniques, and simulation models. The goal is to move from the reconstruction of particular activity patterns to the systems of organization that regulate production, distribution, and consumption at every level of society.

QUESTION 4: HOW WAS PRODUCTION OF EACH MAJOR CLASS OF MATERIAL GOODS ORGANIZED?

4a: Where did production take place?

4b: Did manufacture or procurement involve more than one stage? Was each stage done at a different location?

4c: How many personnel were involved at each stage of production?

- 4d: What statuses of groups were involved in production?
- 4e: How much time was required for the task?
- 4f: How are the activity loci distributed within each level of the spatial hierarchy?
 - (1) Are they equally or differentially distributed?
 - (2) Are they restricted to some level?

QUESTION 5: WHAT WERE THE PATTERNS OF CONSUMPTION FOR EACH MAJOR CLASS OF MATERIAL GOODS?

- 5a: Where were the materials consumed?
- 5b: By whom were the materials utilized?
- 5c: Were the probable units of consumption different from those involved in their production?
- 5d: Were certain goods utilized only by groups of a certain status?
- 5e: Were durable goods reutilized?
- 5f: With what levels of the spatial hierarchy are the units of consumption associated?

QUESTION 6: HOW WAS EACH MAJOR CLASS OF MATERIAL GOODS DISTRIBUTED?

- 6a: Between which levels of the spatial hierarchy were goods distributed?
- 6b: What was the direction of flow?
- 6c: How many distributional steps were involved?
- 6d: What groups and statuses were involved in the distribution? Were these different from the units of production and/or consumption?
- 6e: By what mechanisms were goods distributed?
- 6f: Was stockpiling or storage involved?
- 6g: Were the materials equally accessible to all members of the society?
- 6h: Were materials distributed as raw resources or as finished products?

QUESTION 7: GIVEN THE PATTERNS OF PRODUCTION, CONSUMPTION AND DISTRIBUTION DERIVED FROM QUESTIONS 4a-4c, WHAT WAS THE SYSTEM OF ECONOMIC SOCIAL ORGANIZATION?

- 7a: What groups comprise the basic units of production? of consumption?
- 7b: What, if any, were the mechanisms for resource distribution? What classes of goods were distributed?
- 7c: Is there any evidence for differential access to any resources?
- (1) Which groups were involved?
 - (2) Which resources?
- 7d: Is there any evidence for economic specialization?
- (1) What specialties?
 - (2) At what levels did specialization occur?
- 7e: Were there any scheduling conflicts in procuring resources?
- (1) What resources?
 - (2) How was the conflict resolved?

Problem Domain 3, Subdomain 3: Political Organization

Political organization refers to the presence of and to the activities of a central authority or leadership operating within the community social structure. Leadership may constitute a formal group with its own internal structure and conventions or may exist informally as part of the status network of the community.

Specific lines of inquiry that might be applied to specific research in the area of political organization are as follows:

Model formulation. Modern Pueblo ethnographies and works on social organization of Anasazi and prehistoric southwestern cultures should be consulted. As modern Pueblo political organization probably does not parallel leadership structure in early Anasazi periods, other works dealing with Formative cultures should also be considered.

Archaeological evidence. At the regional level, the applicability of geographic models such as central place, nodes and networks, and nearest neighbor should be evaluated in determining whether the regional data base has spatial order. Evidence of ordering might be used to infer political organization; description of such regional organizations can be in the form of a "best fit" model generated through evaluation and reformulation of ethnographic archaeological models. Hence rigorous settlement pattern studies and a regional sampling design are critical in conducting research into regional political systems. The researcher should be aware of possible site types and architectural edifices associated with regional political groups or activities such as boundary markers, towers, regional communications networks, redistribution centers, etc.

At the community and intra-community levels, recognition and description of status networks are critical aspects of political or leadership research. Status groups in the archaeological record can perhaps most easily be defined by the evaluation of the quantity and quality of material culture associated with individuals, households and interhousehold groups; estimations of domestic and other social space may be a profitable course of evidence as well. High status groups or political groups within the community may occupy dominant or centralized locations within the community cluster. The researcher should also be aware of possible specialized structures and features that may be associated with political activities. Leaders may have possession of unique artifacts, which may have served as symbols of their authority.

QUESTION 8: WHAT POLITICAL ORGANIZATION EXISTED PREHISTORICALLY IN THE PROJECT STUDY AREA?

- 8a: Did communities in the project study area incorporate a formal political structure or did political authority operate informally as part of other social groups, e.g., did Anasazi communities have a political organization as such? (This question is closely allied with the problem of group identification as set forth in subdomain 1. The presence of political groups in Anasazi communities may be used to infer the social level reached by southwestern cultures.)
- 8b: What was the role of status networks in these communities; what were possible political functions of such groups? (The question is again closely related to subdomain 1. Ascribed and possibly achieved high status positions may have political or leadership characteristics or ascribed high status may be the result of membership in a leadership group.)

QUESTION 9: AT WHAT LEVELS DID POLITICAL ORGANIZATIONS OPERATE WITHIN ANASAZI SOCIETY?

- 9a: Did political groups operate at the interhousehold level within communities?
- 9b: Did Anasazi societies have a community leader(s) or headman?
- 9c: Were there regional political systems or spheres of influence? Where and what activities did such groups oversee? Did political groups identify and maintain territories and boundaries?

QUESTION 10: WHAT FUNCTIONS WERE PERFORMED BY EXISTING POLITICAL ORGANIZATIONS AND WHAT ACTIVITIES AND SOCIAL GROUPS DID THEY OVERSEE? WHAT ACTIVITIES WERE ORGANIC TO POLITICAL GROUPS? (THE QUESTION IS RELATED TO AREAS OF STUDY DESCRIBED IN SUBDOMAINS 1, 2, AND 4.)

- 10a: What economic activities and groups were overseen by a political hierarchy?
- 10b: What social activities and conduct were sanctioned by the political leadership? Did the leaders of the community enforce mores and conventions?
- 10c: What was the relationship between political groups and information flow within and between communities? Did community leaders oversee communications with foreign communities; were trade relations governed by leadership groups (tie in with Problem Domain 4)?
- 10d: Were ceremonial activities and groups overseen by political groups? Were ceremonial activities performed to further political ends?

Problem Domain 3, Subdomain 4: Ideology and Ceremony

The ideology of the peoples in the cultures under study is approachable in the archaeological record only through its material manifestations. Most of these manifestations are traditionally called ceremonial by archaeologists - probably a fair appellation, but rather uninformative, since in modern Pueblo societies religion pervades all aspects of life. The operation of religion has been divided into three categories by Rappaport [4]: ultimate sacred propositions, ritual, and religious experience. The ultimate sacred propositions, or dogma, as well as the religious experiences by the performance of ritual are difficult to define archaeologically. However, ritual is the socially enacted aspect of religion, and a behavior set which leaves archaeological traces.

How can we define these ritual or ceremonial aspects of culture in the Escalante Sector? One attractive approach is to identify patterns of religious behavior documented among modern Southwestern Indian groups, particularly the Pueblo peoples who are generally believed to be the living descendants of the Anasazi. Indeed, analogy with these groups suggests a long list of materials and facilities also thought to be present prehistorically in the Escalante Sector. Minimally this list includes structures such as kivas, great kivas, and perhaps small rooms in surface structures serving as meeting places for sodalities (Dozier [5:45-46]). Hill [6:23]) and Smith [7:154-65]) have suggested lists of test implications for identifying kivas. Other facilities and features which can be identified as being of at least partly ritual function include plazas, pictographs, petroglyphs, sipapus, tri-wall structures, and both human and animal burials. Individual artifacts which by ethnographic analogy might be assumed to have ritual significance include

quartz pebbles (lightning stones), "killed" ceramic vessels, kiva jars, grave goods, Corn-Mother Goddesses, figurines, fetishes, remains of exotic animals such as parrots, medicine bundle collections, pipes, and evidence for religious-experience-inducing materials such as Datura.

QUESTION 11: WHICH OF THE GROUPS IDENTIFIED IN SUBDOMAIN 1 CAN BE ASSOCIATED WITH RITUAL FUNCTIONS?

Using ethnographic analogy it appears that there may be several hierarchical levels for community ritual: the household level, the lineage/clan level, the sodality level, the moiety level (in the Eastern Pueblos), and the community-wide level. The study of the consistency of ceremonial activities horizontally on any of these hierarchic levels will be of use in identifying groups and group composition.

QUESTION 12: WHAT ARE THE FUNCTIONS OF THE KIVA AND GREAT KIVA STRUCTURES? WHAT IS THEIR DISTRIBUTION ACROSS THE NATURAL AND CULTURAL LANDSCAPE DURING EACH PHASE IN THE ESCALANTE SECTOR?

Ford [8] has suggested that the periodic rituals of modern Pueblos serve as regulatory mechanisms to cope with erratic and unpredictable variations in the environment affecting food supply on very local levels. If true, one would expect to see evidence for the growth of such regulatory activities concomitant with the rise of agriculture as a major food source in environments where agriculture is a marginal activity.

QUESTION 13: WHAT ROLE DID CERTAIN SITES (SUCH AS GRASS MESA, WHICH PRESUMABLY SERVED A CEREMONIAL ROLE VIS-A-VIS THE SITES IN THE SURROUNDING AREA) PLAY IN THE CEREMONIAL INTEGRATION OF THE LOCALITY? CAN LOCALITIES BE DIFFERENTIATED FROM EACH OTHER SYNCHRONICALLY ON THE BASIS OF DIFFERENT STYLES OF CEREMONIAL ACTIVITY IN EACH? OR DO ALL PARTICIPATE IN A LARGER, COMMON PATTERN? WHAT ROLE DO THE OTHER SITE TYPES IN EACH LOCALITY PLAY IN THE CEREMONIAL ACTIVITY OF THE LOCALITY?

QUESTION 14: WHAT ENVIRONMENTAL VARIABLES CORRESPOND TO THE AREA OF CEREMONIAL INFLUENCE OF EACH OF THE MAJOR SITES?

In a sector where the localities are environmentally distinct from

each other a certain economic specialization might be anticipated; if these localities also correspond to units of ceremonial identity it might be suggested that one function of the community structures is inter-locality movement of materials.

QUESTION 15: WHAT IS THE RELATIONSHIP BETWEEN POLITICAL LEADERSHIP AND CEREMONIAL LEADERSHIP?

It is generally agreed that one frequent path to the increasing centralization of power seen in "Big Man" and chiefdom-level societies is the personification of both kinds of power in one individual. Did this happen in the Escalante Sector? If not, why not?

PROBLEM DOMAIN 4: FOREIGN INTERACTIONS

GENERAL LOGIC: Given that nearly all human societies, whether based on hunting and gathering economies or complex industrial technologies, have a culturally structured way of interaction with "foreigners," how is this operational in the study area? Given both the area's neighbors and a broader sphere of Mesoamerican influence, with whom did the Dolores people interact? By what mechanisms (e.g., political domination, population migration, economic interchange (perhaps including spouse exchange)) did they interact, and how intensively? How were these interactions integrated into broader area-wide social, economic, political, and/or ideological systems in any one temporal unit? Why was one mechanism used rather than another, one group dealt with more extensively than another?

There is an initial problem of defining the socio-political units of interaction here; because the interactions within the Dolores Project, particularly within the Escalante Sector, are dealt with in Problem Domain 3, analysis will focus on the interactions external to the Escalante Sector, with neighbors or distant social entities who are foreign to Escalante.

In order to define the presence of "foreign" or "exotic" data within the project area, assuming that data reflect patterns of foreign interaction that can be delineated on the basis of archaeological information, one must first search the ethnographic and social science literature to develop hypothetical models of such interaction mechanisms. Test implications of each of these models - the artifactual and contextual data and patterning that are associated with each mechanism - should then be outlined from the literature. Finally, the Dolores data should be

searched to define the presence or absence of similar data - to test the presence or absence of evidence of similar mechanisms operative in the Dolores data, within any one temporal unit. In order to understand the relationship of Dolores people to external communities, the archaeological records from those communities also need to be searched for data that are of Dolores origin - foreign to those foreigners - and then both the external and internal information used as the ultimate basis for evaluating the mechanisms of Dolores interactions. Finally, the systemic organization of these mechanisms within the Dolores socio-political structure needs to be evaluated, and the intensities of interaction with any one neighbor, or distant contact, in order to fully understand foreign interactions of the Dolores communities.

QUESTION 1: BASED ON THE DEFINITION OF EXOTIC ITEMS, AND EXPECTATIONS OF DOLORES ASSEMBLAGES, WHAT SPECIFIC ITEMS OR FEATURES FOUND IN THE PROJECT DATA MAY BE IDENTIFIED AS "EXOTIC"? WHAT ITEMS REFLECT EXOTIC "IDEAS" APPLIED TO LOCAL MATERIALS?

QUESTION 2: BASED ON THE LITERATURE (ESPECIALLY ETHNOGRAPHIC, OTHER ASPECTS OF THE SOCIAL SCIENCES), WHAT MECHANISMS FOR FOREIGN INTERACTION CAN BE USED AS MODELS FOR INVESTIGATING THE PROJECT AREA RELATIONSHIPS WITH NEIGHBORS AND DISTANT CONTACTS?

2a: War, political domination?

2b: Population migration in or out of the region, resulting in continuities of relationships?

2c: Economic exchange, which may or may not include exchange of spouses?

2d: Diffusion of ideas?

QUESTION 3: FOR EACH OF THESE MODELS, OUTLINE SPECIFIC ARTIFACTUAL/ ARCHITECTURAL/CONTEXTURAL DATA THAT WOULD BE EXPECTED TO BE LEFT AS ARCHAEOLOGICAL RESIDUES IF THE MODELLED MECHANISM HAD BEEN USED BY THE ARCHAEOLOGICAL POPULATION.

3a: What is a general definition of "exotic" materials?

3b: Given the models of Southwestern ethnography and archaeology, what specific "exotics" could be expected to occur in the Project area archaeological data?

- (1) ceramic assemblage (materials, designs, technologies)
- (2) lithic assemblage (materials, designs, technologies)
- (3) bone tools, unworked bone remains
- (4) vegetal tools, unworked vegetal remains
- (5) architectural techniques
- (6) architectural layouts

QUESTION 4: BASED ON THE DEFINITION OF EXOTIC ITEMS, AND MODELLED EXPECTATIONS AND/OR EXPERIENCE WITH THE OCCURRENCE OF THESE IN GENERAL SOUTHWESTERN CULTURES (PAST AND PRESENT), IDENTIFY ITEMS OF PROJECT-AREA ORIGIN THAT OCCUR IN NEIGHBORING ASSEMBLAGES OF THE SAME TEMPORAL UNIT. IDENTIFY ITEMS OF INDIGENOUS MANUFACTURE BUT WHICH CONFORM TO DOLORES IDEAS IN FOREIGN ASSEMBLAGES. IDENTIFY THESE IN MESOAMERICAN ASSEMBLAGES IF POSSIBLE.

QUESTION 5: GIVEN THE OCCURRENCE OF EXOTIC ITEMS AND IDEAS IN THE DOLORES DATA, AND DOLORES-ORIGINATED ITEMS AND IDEAS IN FOREIGN CONTEXTS, AND THE HYPOTHETICAL MODELS OF INTERACTION MECHANISMS, WHICH OF THE LATTER WERE USED BY THE DOLORES POPULATION?

QUESTION 6: GIVEN THE MECHANISMS OF FOREIGN INTERACTION USED BY DOLORES PEOPLE WITHIN ANY ONE TEMPORAL UNIT, HOW WERE THESE MECHANISMS INTEGRATED WITHIN THE SOCIAL, ECONOMIC, POLITICAL, AND IDEOLOGICAL SYSTEMS AT DOLORES?

- 6a: How were the various mechanisms used in varying degree, with different populations?
- 6b: Did foreign interactions provide significant input to the economic organization of the Dolores people?
- 6c: Did foreign interactions provide significant input to the social organization of the Dolores people, e.g., by providing broader kinship networks?
- 6d: Did foreign interactions result in significant political interaction of Dolores and other groups?

Given that these questions can be answered, the question becomes one of why such patterns developed and were used. These "why" questions must in turn be based on models of interacting mechanisms and their benefits/

costs, and an application of those models to the Dolores data. This is more a function of Problem Domain 5, cultural variation over time, since mechanisms are probably used for their adaptive value and can hence be best judged in a diachronic view of adaptation.

PROBLEM DOMAIN 5: CULTURAL PROCESS

GENERAL LOGIC*: Given the diachronic framework of assigned cultural periods and calendar dates** for the Dolores Archaeological data, what patterns of diachronic archaeological variation/identity occur at Dolores? How does this time-sensitive patterning reflect cultural process, including both change and stability? Based on extant scientific models of cultural process (based on environmental, demographic, and inter- and intra-group social systems), and developing further models of the archaeological manifestations that might be expected for these various models, how can we best explain why the Dolores cultural systems developed or were maintained over time? Given our identification of periods of change in the cultural systems reflected in the archaeological record, how can we best explain these at Dolores? Based on the Dolores analysis what general implications can be drawn for explaining how and why human domestication of food resources has developed.

*n.b. This Problem Domain is the point of articulation of data and questions in Problem Domains 1-4, and is a display of whole synchronous systems in order to analyze diachronic systemic variation.

**n.b. Within this Problem Domain we have an opportunity of testing our periodization models by looking at diachronic variation just in terms of calendar dates on one hand, and in terms of periods on the other hand, and seeing how well the two data displays match.

QUESTION 1: HOW DO THE PROJECT-AREA DATA, IN THE BIVARIANT FRAMEWORK OF BOTH CALENDAR DATES (FROM DENDROCHRONOLOGY, ARCHAEO-MAGNETISM, RADIO-CARBON AND ARTIFACT SERIATION) AND ASSIGNED PERIODS (E.G., BASKETMAKER II, ESCALANTE SECTOR PHASE SCHEME) VARY OVER TIME?

- 1a: Identify both variability or difference and sameness or stability in attributes over time.
- 1b: Look at specific attributes (Rouse's [9] time-sensitive "modes") such as ceramic paint type, attribute clusters (as they define ceramic types, for instance, of project paint styles), and inferred behavioral systems (e.g., maize domestication).

- 1c: Look at all four problem domains. Identifying what you are looking at is in large measure a strategic function of the test implications of your hypothetical models of cultural process (see Question 3).

QUESTION 2: WHAT PATTERNS OF CULTURAL STABILITY AND CHANGE CAN BE INFERRED TO HAVE OCCURRED IN THE PROJECT AREA (THIS IS A WHAT-HOW QUESTION, NOT A WHY)?

- 2a: Did changes in economic strategy occur?
- 2b: Were there changes in settlement pattern? In inferred demographic and social structural patterns?
- 2c: In extra-regional interactions?
- 2d: In the interaction of all these inferred cultural patterns?

QUESTION 3: WHY DID THESE PATTERNS OCCUR IN THE PROJECT AREA'S PREHISTORY?

- 3a: Identify hypothetical models explaining cultural variability, based on the literature. Offer multiple models, looking at various aspects of ecology, demography, social organization and foreign intervention.
- 3b: Develop test indications of the expected archaeological manifestations of the theoretical explanatory models.
- 3c: Array the project-area archaeological data and inferences against 3b, to identify most appropriate theoretical explanations of the Dolores variations; if none fit, suggest why not.
- 3d: Look at stability and change in explaining adaptive strategies and human-environment interactions.
- 3e: Propose and conduct additional studies to further explain or qualify the results of 3c.

QUESTION 4: BASED ON ANALYSIS OF THE DOLORES DATA, WHAT CAN BE INFERRED ABOUT THE ROLE OF DOMESTICATION IN GENERAL HUMAN CULTURAL SYSTEMS?

- 4a: Why were domesticates introduced and accepted in the project area?
- 4b: What shifts or accommodations to other cultural systems were made in response to the introduction of domesticates?
- 4c: What was the long-term effect of domesticates on Anasazi culture?

4d: What conclusions can be drawn on the role of domesticates in cultural evolution based on the project material?

QUESTIONS 5: HOW CAN POPULATION MOVEMENT, GROWTH AND DECLINE WITHIN THE ESCALANTE SECTOR BE ACCOUNTED FOR?

5a: What environmental factors might be involved?

- (1) What data from ethnographic/historic records might apply to this situation?
- (2) What evidence is there for environmental variability during the prehistoric period (drought, soil exhaustion, temperature variability, epidemics in human and resource populations, resource depletion). What techniques can be employed to estimate variability? (Tentatively, a simulation of population growth and decline may be useful. Also, specific studies directed at explaining why the Anasazi moved out of the area are contemplated).

5b: What social factors might be involved?

- (1) What are applications from the ethnographic/historic record?
- (2) Is there evidence for cultural stress (violence, defensive mechanisms, changing subsistence strategies)?

REFERENCES CITED

- [1] Service, Elman R., Primitive social organization: an evolutionary perspective. Norton: New York. 1962.
- [2] Binford, Lewis R., Archaeology as Anthropology. American Antiquity 28, pp. 217-225. 1962.
- [3] White, Leslie A., The evolution of culture. McGraw-Hill: New York. 1959.
- [4] Rappaport, R.A., Ritual, sanctity, and cybernetics. American Antiquity 73:59-76. 1971.
- [5] Dozier, Edward P., Southwestern Social Units and Archaeology. American Antiquity 31:38-47. 1965.
- [6] Hill, James, Broken K Pueblo: prehistoric social organization in the American Southwest. University of Arizona. Anthropological Papers No. 18. 1970.
- [7] Smith, Watson, Excavations in Big Hawk Valley, Wupatki National Monument, Arizona. Museum of Northern Arizona, Bulletin 24, Flagstaff. 1952.
- [8] Ford, Richard I., An ecological perspective on the eastern Pueblos. In New Perspectives on the Pueblos, edited by Alfonso Ortiz, pp 1-17. School of American Research, University of New Mexico Press. Albuquerque. 1972.
- [9] Rouse, Irving, The classification of artifacts in archaeology. American Antiquity 25:313-323. 1960.