Non-site analysis of the archaeology of the Wasatch Plateau, Utah

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A Non-Site Analysis of the Archaeology of the Wasatch Plateau, Utah.

by

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Abstract

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A Non-Site Analysis of the Archaeology of the Wasatch Plateau, Utah.

Abstract:

During the past 20 years site-based archaeological survey and analysis have come under criticism. Some archaeologists consider the concept of the site to be flawed in itself, or at the least, restrictive of our understanding of prehistoric land-use patterns. Non-site archaeology offers an alternative in which the artifact replaces the site as the minimal unit of observation. This allows entire regions to become the spatial units of analysis. Non-site archaeology also allows archaeologists to compare datasets. One problem occurs when archaeological survey projects vary in their definitions of what constitutes a site. I have used a non-site approach to minimize the effects of this type of variation. This thesis draws from the databases of two federal agencies and compares artifact patterning between two regions.

The relative proportions of projectile points, lithic cores, groundstone materials, and ceramics recorded above 9000 feet on the Wasatch Plateau are compared to the proportions of these artifacts recorded on adjacent lands below 7000 feet. Each artifact type represents a particular aspect of prehistoric land-use. Chi-square analysis of the data indicates that there is a predictable relationship between relative proportions of artifacts and region. A difference in relative proportions of artifact across regions is interpreted as being indicative of a difference in land-use practice.
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CHAPTER I
Introduction

The National Historic Preservation Act of 1966, and related legislation such as Executive Order 11593, charge federal agencies with the responsibility for identifying and managing cultural resources located on public lands. These cultural resource management (CRM) responsibilities drive a large portion of the archaeological fieldwork currently being performed in the United States. The archaeological databases generated by CRM projects and held by federal agencies present both opportunities and challenges. One opportunity is simply that large volumes of data are available for analysis. The variation in content and quality of that information, and its applicability to addressing research questions, presents a challenge.

Cultural resource management reports rarely provide careful analyses of activity areas, material remains, and tool forms within sites to develop a clear picture of the cultural activities that took place at specific locations. Sites may be labeled with non-committal descriptive terms, such as "lithic scatter", which provide only a general summary of the material content of the site. As an alternative, project reports may provide functional interpretations of individual sites and assign labels such as "short term campsite" or "habitation site" on the basis of observations regarding the amount and diversity of cultural debris or the presence of specific features and artifacts such as hearths or groundstone tools. The reader is forced to accept these labels and is left to infer subsistence and land use patterns for the project area from the resulting list of site "types". Comparison of subsistence and land use patterns between environmentally distinct regions is simply beyond the scope of most cultural resource management projects.
In this thesis I will investigate one possible way of making such a comparison using data from cultural resource management projects. My goal is to analyze cultural materials found within two contrasting regions for evidence of differences or similarities in prehistoric land use practices. The regions are defined on the basis of elevation. In the western United States such a division usually parallels a division in land management status. In locations featuring extensive federal holdings, relatively higher elevations tend to fall under U.S. Forest Service management while lower elevations tend to be managed by the Bureau of Land Management. I am therefore additionally compelled to develop an effective way of drawing information from the archaeological data sets of two different federal agencies.

I propose that a non-site approach will address the problem of using data from two sources as well as provide a more complete picture of regional land use practices. A non-site approach employs individual artifacts as units of observation and analysis. Artifacts found both within and between sites contain important data regarding past land use practices, including subsistence and resource procurement activities. Indeed sites may reflect only a portion of the full range of activities that constitute a cultural system.

In the summer of 1996 I participated in an archaeological reconnaissance of selected timber units proposed for sale as part of the South Manti timber sale on the Manti LaSal National Forest in central Utah. This project generated an extensive list of isolates--artifacts recorded outside the boundaries of conventional sites. We recorded 12 prehistoric sites, yet nearly half of the projectile points we located (17 of a total of 37) were recorded as isolates. In a standard site-based analysis the information presented by these isolated artifacts would be overlooked. By regarding the entire region as the spatial unit of analysis, and the artifacts themselves as the units of observation, a more complete picture of how prehistoric humans used the land may be achieved.

The ability to compare and contrast data from two different sources represents a
second advantage of using a non-site approach. In practice, a site is generally defined as a
cluster of artifacts that meets or exceeds some minimum threshold in terms of the number
of artifacts present. When agencies or reports vary in their definitions of what constitutes
a site, site-based comparisons become meaningless or impossible. A non-site approach
avoids this problem by comparing units of observation, individual artifacts, that are
consistently defined and uniformly recognized.
CHAPTER 2
Non-site Archaeology

Traditionally the site has been regarded as the basic unit of archaeological analysis. "Archaeologists look for, and find sites (e.g. site surveys); they record sites (e.g. state surveys, the National Register of Historic Places); they collect and/or excavate sites, they interpret sites; and incredibly, they even date sites" (Dunnell 1992:21). Thomas (1975:61) commented that "the site concept seems so ingrained into the conventional wisdom of archaeology that few stop to consider how much we truly rely upon the concept."

Dunnell and Dancey (1983:271) remarked that "archaeological data are seen as originating within naturally occurring units called sites, and the location and exploration of these units are usually the goals of field research." In the past 20 years, a number of archaeologists have raised the issue of whether the site is, or should be, the fundamental unit of observation in archaeology (Dunnell 1992, Dunnell and Dancey 1983, Ebert 1992, Foley 1981, Thomas 1975). They cite theoretical and practical problems with the "site notion" and suggest that the types of questions we wish to ask of the past may be better answered by also considering what lies outside of and between sites. Ebert (1992:xiii) commented that "the most critical question in archaeology today [is] whether we can continue to think in terms of 'sites'"

Critics of site-based archaeology consider whether the site concept itself is flawed, or whether methods dependent on the "site" are faulty. They examine how we define and apply the term "site". The question is raised as to whether site-based archaeology limits the types of questions we can ask of the archaeological record. Does our reliance on the site as a unit of observation bias our interpretation of past human behavioral systems?
Criticisms of the site concept and site-based archaeology pertain in particular to evaluations of the archaeological record that are based upon surface manifestations. The surface record is recognized as a valuable source of information, but one which poses particular challenges (Dunnell and Dancey 1983, Ebert 1992). Surface deposits are indeed "vital since they may be the only remnant of some prehistoric task activities" (Thomas 1973 167). However, proponents of non-site archaeology note that it is frequently impossible to distinguish between components in surficial sites: we cannot rely upon vertical separation to help us identify temporally distinct episodes in the development of a surface site. The material remains from different episodes of occupation and individual events may be "smeared" together. We cannot assume that each cluster of artifacts represents the location of a discrete activity since clusters will also occur where activities or events overlap. Non-site archaeologists also point out that not all of the surface record occurs in the bounded units that we label "sites" Foley (1981 163) remarked that "the archaeological record of mobile peoples should be viewed not as a system of structured sites, but as a pattern of continuous artifact distribution and density " Non-site archaeologists propose that what is called for is a different scale of observation: one that focuses on the individual artifact rather than on the site. Non-site approaches address the challenges of interpreting surface materials and offer alternative methods of deriving insight into patterns of human behavior.

What is a site? "Sites" have been defined as either locations where cultural materials are found or as manifestations of human behavior, or both. Dunnell (1992) traced the archaeological use of the term back to its English meaning of a place or location. He noted that American archaeologists used the term in a generic sense to denote places of archaeological interest. Current definitions of "site" continue to include aspects of the idea that a site is a place where archaeological material is located. If we view the archaeological record as consisting of a variably dispersed scatter of cultural
materials, then a site may be defined simply as an area of higher density; a location distinguished by a cluster of artifacts or features. "Site" may also be associated with human activities: sites are "places where artifacts, features, structures, and organic and environmental remains are found together.. places where significant traces of human activity are identified" (Renfrew and Bahn 1991:42). The idea of "site" as activity locus currently dominates the general archaeological viewpoint: the emphasis falls on "activity" rather than on the "traces"-- the artifacts, features, or structures. In practice, a cluster of lithic debris in association with a hearth becomes a "camp site" "Site" takes on functional overtones-- becoming a stand-in for village, camp, quarry-- a location where specific activities took place rather than a location where material remains cluster Non-site archaeologists argue against this view that sites represent easily interpretable or meaningful units of past human behavior.

Dunnell (1992:26) argued that sites have nothing to do with actual events of the past but are instead modern constructs and not "archaeologically relevant units." In Dunnell's analysis a site is only a concentration of artifacts, not a discrete item with an independent existence. "Sites, as they are observed by archaeologists, are created by the act of observation at a particular point in time" (Dunnell 1992:27). Dunnell noted that sites do not result solely from human activities, but are also shaped by ongoing natural processes. Materials may be added, subtracted, or rearranged by both cultural and natural agents. Dunnell (1992:27) summarized. "sites are not units of deposition; they are accretionary phenomena" and since "sites are not units of formation, then they have no legitimate role as units of observation." In Dunnell's eyes, sites are not "real" Dunnell (1992:32) considered the concept of "site" itself to be flawed and believed it to be "absurd, given that sites cannot be asserted to exist outside the present, to accord site any theoretical role in archaeology"
As an alternative, Dunnell proposed a "siteless" archaeology in which the artifact serves as the unit of observation. Dunnell expressed confidence in archaeologists' ability to objectively identify individual artifacts and noted that artifacts, in contrast to sites, "are units of deposition or subdivisions of such units" (1992:34). Dunnell promoted an approach to interpretation that builds up from the artifact to "archaeologically relevant spatial aggregates" (1992:35) rather than attempting to separate out meaningful aggregates from artificial units (sites).

Ebert (1992) paralleled Dunnell in his critique of the accepted linkage between "sites" and past human behavior and the appropriateness of the site as a unit of observation. Ebert (1992:24) attacked the "assumption that clusters of artifacts and features found in the archeological record correspond to discrete behavioral episodes" and provided a discussion of how reuse of certain areas, for very different activities, may result in what appear to be "sites" Ebert (1992:14) also acknowledged the continuity of the archaeological record and criticized the tendency to assume that the "only reliable data comes from 'sealed sites', or in fact from 'sites' at all" Ebert (1992:70) called for an "antisite" archaeology that "has nothing to do with sites, at least at the methodological level." Like Dunnell, Ebert believed that archeologists discover artifacts, not sites. But, from this common base Ebert and Dunnell diverge in their application of a non-site, or artifact-centered, archaeology Dunnell sought to analyze the individual artifact and its deposition as a means of building temporally meaningful spatial aggregates. Ebert adhered to an "ahistorical" (Kvamme 1994) approach that used statistical methods to define clusters of artifacts. After a methodological emphasis on the individual artifact, Ebert proceeded to statistically identify and interpret clusters relative to systemic expectations.

Although differing in application, both Dunnell and Ebert's non-site approaches exposed the ambiguity surrounding the definition and application of the term "site" The concept of "site" itself may, however, not be fundamentally flawed. As noted by Thomas
"our concepts must be helpful rather than restrictive" and the choice to "ignore traditional sites altogether" must be based on the objectives of our research. Binford (1992.46), adhered to a definition of "site" as "a spatial concentration or high-density occurrence of artifacts" and countered Dunnell's (1992) arguments against the site concept. Sites are "real" they do exist as clusters of cultural materials. Distributional methods such as those advocated by Ebert (1992) in fact demonstrate that artifacts do cluster on the landscape. Dunnell and Dancey's (1983:273) application of a distributional approach to "siteless survey" involves defining "clusters (sites) on the basis of density within each environmental zone." In Binford's (1992.48) analysis, our method may be "flawed" and "riddled with ambiguity" but the concept of the site continues to provide a framework within which we can analyze human systems of adaptation. Site-based and non-site approaches represent different scales of observation and we do not necessarily need to abandon the site concept.

Neither do we need to abandon the idea that there is an association between clusters of cultural remains and human activity. We recognize that humans tend to be social in nature and to congregate in groups. The debris left behind by humans should also occur in groups. We perceive that humans make rational decisions with regards to the placement of their settlements and activities. Therefore we expect the archaeological record to reflect organized patterns of behavior and to consist of non-random clusters of material. A problem arises when this association between sites and activities leads to a simplistic interpretation of "site" as the location of a single event or as representing one short period of time. Ebert (1988, 1992) provided a strong criticism of this tendency to regard sites as the actions of one group at one point in time. "Reuse of places calls into question the equation of clusters of materials with 'sites' that we can interpret conventionally and label as organizational entities, such as residences, hunting camps, or tool manufacturing locations" (Ebert 1992:33). Binford (1980:9) noted that, over long
periods of time or in areas where resources cluster, "we might anticipate considerable palimpsest accumulations that may 'look' like sites." The archaeological record results from a variety of aspects of human systems and activities within these systems may overlap: "sites" may be built from several events. "Attempting to categorize all sites... into behavioral categories such as base camp or limited-activity focus without first ascertaining whether or not a site is a composite of activities, is a misleading exercise" (Kelly 1988a:56).

If we avoid functional oversimplification and accept a definition of "site" as a cluster of artifacts and/or features, then, as Binford (1992) has commented, the existence of sites is not an "intellectual"' problem but an "operational" problem: what constitutes a sufficient aggregation? How do we define "site" on the ground?

Cultural resource management is the umbrella under which a substantial amount of archaeology is currently performed. This holds especially true in the western United States where the Federal government administers large areas. Federal agencies are required, under the National Historic Preservation Act, to "manage" the cultural resources found on these lands or affected by Federal projects. Management responsibility begins when sites are identified and recorded. Indeed, the "site" is the concept around which cultural resource management is structured. Sites are identified and evaluated; preserved, salvaged, or sacrificed. This emphasis on the "site" as a unit of preservation concern would seem to call for a unified opinion as to what constitutes a site. This is not the case: the practical definition of "site" varies between agencies, between states, and even from project to project within an agency or state. "Site" serves primarily as a unit of management-- a "bookkeeping or clerical device" (Dunnell and Dancey 1983:271)-- defined according to the needs of the organization. While working for the Bureau of Land Management I have used a definition that regards a site as consisting of a minimum of two
artifacts found in association. In Montana a site may be "defined" as a grouping of five or more artifacts in an area of 50 square meters. During the 1996 survey on the Wasatch Plateau, from which a portion of the data set for this thesis is drawn, we defined a site as consisting of 15 or more artifacts in a 50 square meter area. Previous fieldwork in the area (McDonald 1993) recorded sites as consisting of 10 or more artifacts in 50 square meters. Schiffer (1987:350) noted that "archaeological phenomena documented as sites in southwestern Arizona could go unnoticed or unrecorded" in areas with more "spectacular remains." This variation in the operational definition of "site," at the least, presents problems for comparison of data from different projects or geographical areas.

Variation in how a site is defined also affects the kinds of information recorded in the field and reported in the final survey report. A number of elements of the archaeological record are not contained within sites-- and this varies according to which field definition is applied. Individual artifacts encountered during survey may be recorded as Isolated Artifacts or Isolated Finds. Clusters of artifacts that fall below the threshold of "site" may be labeled Minimal Activity Loci or MALs. In some cases individual artifacts may not be recorded at all. For example, an area which features an extensive and diffuse scatter of lithic reduction debris, believed to be related to widespread or casual lithic procurement, may be categorized as a "lithic landscape" Areas of relatively higher densities of artifacts within this landscape are recorded as sites and artifacts between these "sites" may be disregarded entirely. Plog et al. (1978) noted that the presence of large, visible sites in an area may also influence the archaeologist's perception of what a site should look like. Plog et al. (1978:386) remarked on the "difficulty of perceiving sparse lithic scatters as sites when... working in an area such as Chaco canyon, where multiroom pueblos with standing architecture and dense artifact scatters are common." On the other hand, in areas with low densities of cultural materials, isolates may simply be missed
because they are less likely to be encountered when using survey patterns that are designed to locate sites (Ebert 1992, Wandsnider and Camilli 1992).

However they're labeled, whether they're recorded in the field or not, these individual traces of past human behavior are frequently overlooked in site-based analyses of land use and land management recommendations. As a result "important elements of the total resource will be purged or simply unmanaged because they are not easily incorporated" within a site-based system of data collection and analysis (Dunnell and Dancey 1983:274). The result of such an "uncritical use of the site concept" is a loss of insight into less archaeologically-visible portions of systems of human adaptation; this approach "strongly biases our knowledge of the archaeological record in favor of those objects and relationships that characterize high density clusters, to the exclusion of the rest of the record" (Dunnell and Dancey 1983:272).

What have we lost when isolates and MALs disappear from the data set? We lose the ability to see beyond the site-- to see either stability or variation over long periods of time and large areas of land. We disregard the evidence of activities that occur away from locations that experience reuse or long term occupancy. We potentially lose evidence of individual events and of the actions of individuals. Answers to questions regarding the full scope of human systems of adaptation run the risk of being incomplete, or possibly even wholly incorrect. This potential for a biased interpretation of the archaeological record represents the most troubling aspect of site-based archaeology.

A review of the interaction between hunting and gathering lifeways and the formation of the archaeological record (Binford 1980, Ebert 1992) exposes ways site-based archaeology may limit our ability to interpret the archaeological record. Hunter-gatherer groups tend to be highly mobile and to leave a dispersed and low density pattern of artifact discard. Settlements may take the form of seasonally or temporarily occupied
camps. Specialized activities such as hunting, plant harvesting, or quarrying of lithic materials may take place at dispersed locations. Some tasks may be performed by smaller divisions of the group or by individuals. Each of these aspects of the total subsistence and settlement pattern may result in very different patterns of artifact discard.

Archaeologically recognizable "sites", or high density clusters of cultural materials, may only occur in areas that are occupied for long periods or are subject to multiple episodes of reuse. When we restrict data collection to the information contained within sites, we lose portions of the total picture of hunter-gatherer adaptation. We lose evidence related to the activities of individuals or smaller units within the group; we lose insight into the diversity of activities that make up the full system of interaction between the group and its environment.

Lewis Binford argued (1992) that the explanation of patterning in the archaeological record is our goal and to achieve this goal we must "accept responsibility for a systemic approach." In essence, the archaeological record presents evidence of past systems of organization or adaptation. Our job is to link these traces, through theory, to an understanding of both stability and variation in cultural adaptations. In Binford's eyes, the artifact is and always has been "the basic unit of observation" (1992:44). Sites do exist: they are clusters of artifacts. Sites are not "bad ideas," only a different spatial scale of observation. Binford viewed non-site archaeology as simply a change in spatial scale from "site" to "landscape". "By changing our observational scales for looking, do we place ourselves in a strong learning posture? Potentially For instance, by expanding our scale to regions instead of aggregates of artifacts, we clearly gain the opportunity to see patterning among artifacts that are not commonly discarded or lost in human settlements. Similarly we gain the opportunity to relate forms of artifact distributions to geomorphological forms as well as variation in the stability and conditioned dynamics of landforms" (Binford 1992:49-50).
David Hurst Thomas, an early advocate of the non-site approach, also viewed the artifact as an appropriate unit of observation for archaeological research. Thomas' Reese River (1975:64) study employed a non-site approach to test Steward's theories, derived from ethnographic research, regarding prehistoric Shoshonean subsistence practices. Thomas sought to test the degree of correlation between theory and the archaeological record and to investigate "how members of a single hunter gatherer society moved themselves across the landscape, in a stable yet flexible pattern of transhumance." Thomas (1975:81) concluded that non-site data collection and analysis provided a way to study non-sedentary groups "who often leave only scanty, widely scattered evidence of their lifeway."

Dunnell and Dancey (1983) advocated a shift from the site to the region as the "investigatory universe" of archaeology as a means of exploring the variability present in the archaeological record. They commented:

where such factors such as land use, settlement pattern, ecological adaptations, and resource utilization are involved... more than a set of isolated locations comprising a minuscule proportion of the region is required. Distributions of artifacts and artifact densities over wide areas are necessary" (Dunnell and Dancey 1983:269). "Using site to structure recovery limits data collection to a small fraction of the total area occupied by any past cultural system and systematically excludes nearly all direct evidence of the actual articulation between people and their environment (Dunnell and Dancey 1983:271-272).

Again, the individual artifact is seen as the primary unit of observation and data collection; the spatial universe of the region is divided into varied environmental strata and the distribution of artifacts within each strata is investigated.

**Applications of Non-site Archaeology**

Whether referred to as distributional, off-site, or landscape archaeology, non-site approaches hold one thing in common. the individual artifact serves as the primary unit of
observation. Such an approach is founded in an awareness of the archaeological record as a continuous scatter of cultural materials. This scatter is considered to vary in density rather than to consist solely of discrete clusters of artifacts and features. Non-site approaches seem particularly suited to the study of hunter-gatherer adaptive systems—systems whose multi-faceted land use strategies may leave ephemeral traces over large areas and through long periods of time.

The "cultural item" serves as the "minimal operational unit" in Thomas' (1973, 1975) test of Julian Steward’s model of Great Basin Shoshonean settlement and subsistence patterns. Steward described a mobile lifestyle that was dependent upon seasonal exploitation of multiple resources and linked to varied microenvironments. Steward’s ethnographic research identified particular tool assemblages that could be associated with specific subsistence activities. Thomas developed a computer simulation that would predict the "archaeological manifestations" of the Shoshonean subsistence pattern and generate expectations regarding the density and dispersion of artifacts within varied environmental zones. The locations of all artifacts and features were recorded over a 10% random sample of the project area; the observed distribution of these cultural materials was compared to the distributions predicted by the computer simulation. Thomas concluded that the Shoshonean settlement pattern corresponded favorably with the archaeological record and noted that this was an example of a type of archaeological research where "the site concept is not only inessential, but even slightly irrelevant." (Thomas 1975:62).

Ebert (1992) performed a distributional survey in the Green River Basin of southwestern Wyoming. The project was designed to "explore", or support, Ebert's ideas regarding the utility of non-site archaeology and to provide the Bureau of Reclamation with a predictive model to guide future archaeological work. A total of 25 units, each 500 square meters in size, were surveyed and all identified artifacts were mapped in three
dimensions. The project included an experimental assessment of the effectiveness and accuracy of survey techniques and a consideration of local geomorphological characteristics that might affect the location and discovery of artifacts. The resulting dataset allowed Ebert to demonstrate a number of ways in which distributional survey may be used to examine spatial patterns in the surface archaeological record.

Camilli and Ebert (1992) applied a distributional approach to explore the relationships between surface visibility and lithic artifact reuse. They held that recognition of reuse and recycling of artifacts could provide insight into the degree of overlap between various activities within adaptive systems and the long-term history of the reuse of locations. Camilli and Ebert found that lithic debris in areas of low visibility showed signs of extensive reduction of cores which they interpreted as indicating reuse of these locations as secondary lithic sources. The opposite case also existed. cores in areas of high visibility and relatively abundant lithic material exhibited less reduction. The project also provided evidence for the reuse of groundstone and fire-altered rock. Their research demonstrated the difficulty of attempting to reconstruct settlement patterns from surface associations of artifacts and features that may have been deposited during separate episodes of occupation.

Schlanger (1992) demonstrated both an awareness of the importance of individual artifacts and the flexibility to work within the framework of cultural resource management (site-based) projects. Schlanger considered both isolates and sites in her exploration of Anasazi land use patterns. The juxtaposition of these two bodies of data served Schlanger well and yielded "different perspectives" on the prehistoric use of the study area. Through analysis of these different perspectives, Schlanger was able to trace changes in the use of what she terms "persistent places"-- places "used repeatedly during long-term occupation of an area" (Schlanger 1992:94). In Schlanger's analysis, sites provide insight into the
long-term usage of specific parts of the area while isolates testify to the "use of the landscape itself as a persistent place" (1992:105).

Non-site approaches are not without their critics. Non-site archaeology relies upon surface survey and therefore is subject to criticisms that are commonly directed at surface survey in general. In response to the criticism that the surface record is exposed and therefore subject to ongoing modification, Ebert (1992) and Dunnell and Dancey (1983) reminded the reader that buried sites were once surface assemblages and therefore subject to all of the same formation processes that are thought to bias the surface record. Distrust of the surface record in general led Ruppe (1966) to author a defense of surface survey. Ruppe cited two practical advantages: surface reconnaissance is economical as compared to extensive excavation projects and provides archaeological information about large areas of land, thereby filling gaps in our knowledge. Ebert's (1992,19-20) defense of the surface record echoed Ruppe's comments: "surface survey may yield much more useful data than excavation because of the cost-effectiveness of its discovery " In practice, surface survey, under the auspices of federally-mandated cultural resource management policies, is becoming our largest source of information about the archaeological past.

Surface conditions, artifact obtrusiveness, modern land use practices, sedimentation and formation processes all affect the integrity and visibility of the surface record. Survey crew experience and enthusiasm (or boredom) and transect spacing influence the rate of recovery. Transect intervals typically range in width from 10 m to 75 m (Ebert 1992). Individual surveyors may actually be able to inspect only an area 1 to 2 m wide along their transect. In effect, only a small portion of the land is actually inventoried (Wandsnider and Camilli 1992). If the unit of observation is relatively large, for example, a site several meters in width, recovery rates may be high. When the artifact is the unit of observation, a significantly smaller rate of recovery can be expected simply because an individual artifact is less likely to be noticed.
This last observation leads to a criticism specific to non-site archaeology: the apparent need for intensive survey with an "army" of crew members walking "laser thin" transects. Ebert's (1992) and Thomas' (1973, 1975) solution to the need for intensive survey was to perform inventory of only a sample of the entire landscape. Other solutions involve collection of both site and non-site data during inventory (Schlanger 1992) and multistage surveys (Doelle 1977).

Distrust of surface assemblages and practical issues aside, another concern has been raised concerning the results of non-site archaeology: "surface scatters have to be treated as a single chronologically insensitive assemblage, reflecting the repeated use of an area over a long period of time" (Zvelebil, et al. 1992). Jones and Beck (1992:168) echoed this sentiment, stating that: "most dating methods are appropriately applied only to buried deposits and cannot be used in surface contexts." Jones and Beck suggested obsidian hydration dating as a possible solution; Dunnell (1992) speculated on the value of both obsidian hydration and thermoluminescence as surface dating techniques. Schlanger (1992) relied upon the presence of temporally-sensitive ceramics in surface assemblages to provide insight into the long-term usage of specific locations. Binford (1992:57) brushed aside this concern with chronology and noted that it may not be necessary to control for time: "the answer to this criticism is simply that we are addressing the issue of stability here and are seeking to recognize stabilizing conditions. We want to be able to 'see' stability with respect to landforms."

I have chosen to follow Binford's line of reasoning with regard to chronology. The primary issue is to compare the proportion of specific artifact types at lower elevations with the pattern observed in the high mountains of the Wasatch Plateau and to consider what the differences or similarities between the two regions say about land use patterns of the resident hunter-gatherers over time.
CHAPTER 3
High Altitude Archaeology and the Archaeology of the Wasatch Plateau

Relatively little research has addressed the archaeology of the Wasatch Plateau. Cultural resource inventories indicate that the region features a relatively low density of archaeological sites. The majority of these consist of clusters of lithic debris. My experience leads me to believe that a substantial number of artifacts occur outside site boundaries.

The Wasatch Plateau extends north to south through central Utah. Hunt (1974) placed the Wasatch Plateau in the High Plateaus section of the Colorado Plateau physiographic province (Figure 1). The High Plateaus mark the western edge of the Colorado Plateau and divide this region from the eastern Great Basin province. Elevations in the High Plateaus section reach to 11,000 feet above sea level.

The High Plateaus region, and the Wasatch Plateau itself, contain a large portion of the landscapes in Utah that exceed 7000 feet (Figure 2.). DeBloois (1983) commented that little archaeological research had been done in Utah and other western states at elevations in excess of 8000 feet prior to 1970. The majority of high-altitude archaeology conducted during the 1970s and early 1980s in Utah was completed by the U.S. Forest Service in areas other than the Wasatch Plateau (DeBloois 1983, Simms 1979). McDonald (1993) provided a summary of archaeological projects conducted on the Wasatch Plateau. McDonald reviewed a number of sites at elevations in excess of 8000 feet and concluded that the "procurement of faunal resources was a primary economic focus" of prehistoric groups in the area. This conclusion is based on the relative absence of groundstone artifacts found in sites as compared to the number of hunting and butchering tools.
Figure 1. Physiographic map of the Colorado Plateau. From: Hunt, 1974
Figure 2. High altitude regions of the southwest. From: Winter, 1983.
On the basis of its unique location as a boundary marker between two physiographic provinces and between two culture areas, the Wasatch Plateau holds the potential to provide unique insight into the prehistoric record of Utah. Archaeologically, the Wasatch Plateau may best be placed in the Great Basin culture area rather than in the Colorado Plateau (Jennings 1986). Similarities in the biotic conditions and cultural manifestations of the western Colorado Plateau and the eastern Great Basin provide justification for this placement (Aikens and Madsen 1986, Madsen 1989, Schroedl 1976) although the argument might be made that the Wasatch Plateau belongs to neither, or both cultural divisions.

D'Azevedo (1986) and Grayson (1993) noted that "Great Basin" has different boundaries according to whether it's viewed in terms of a hydrographic, physiographic, or floristic division (Figure 3). "The entire periphery of the Great Basin region is in this sense unbounded, and schematic depictions of its limits are based on variable criteria and often arbitrary judgments" (D'Azevedo 1986:10). Grayson (1993) noted a trend of placing the eastern edge of the Great Basin floristic division along the Wasatch Range and high Colorado Plateaus of central Utah. Yet, the "close relation between natural vegetation and cultural distribution" led D'Azevedo to extend the cultural Great Basin further east, along the boundaries of the Great Basin floristic province as defined by Shreve in 1946. This viewpoint places the Wasatch Plateau securely within the confines of the Great Basin region.

Jennings (1986 113) wrote that "the key to understanding prehistoric Great Basin human adaptation lies in the recognition of a myriad of microenvironments. Humans exploited spring- and stream-fed marshes, dry valleys, and the forested mountains." The Wasatch Plateau and its surroundings provide an acute example of this diversity: two valleys lie on either side of forested mountains. One is dry; one may have offered marsh habitats for prehistoric exploitation. Madsen (1989) noted that during the
Figure 3. Great Basin natural provinces. From: D'Azevedo, 1986

Figure 4. Subdivisions of the Great Basin. From: Jennings, 1986
Formative Period, the valleys to the west and east provided environments different enough to foster two distinctive variants of the Fremont culture. Jennings (1986:116) summarized that "the settlement system of the Great Basin ranged along a continuum from the near sedentary, where resources were concentrated, to the highly mobile, where the desired species were patchy and widely dispersed. The very fact of survival of the population testifies to the flexibility and adaptive nature of the Basin cultures."

Further subdivision of the Great Basin (Figure 4) places the Wasatch Plateau into the eastern sub-area (Aikens and Madsen 1986, Jennings 1986). The archaeological record in the eastern Great Basin provides dated evidence of human occupation back to 9000 B.C. Surface finds of fluted projectiles similar to Clovis and Folsom points support a Paleo-Indian presence in the eastern Basin, although little direct evidence exists of the big-game hunting subsistence pattern typically associated with Clovis and Folsom assemblages (Grayson 1993). Schroedl (1991:2) noted that many researchers prefer to use the term Pre-Archaic in the Great Basin since “lifeways during the Paleo-Indian and Archaic Periods... are relatively similar and undifferentiated.” Schroedl himself did not subscribe to this terminology, citing evidence that Pleistocene mega-fauna were present in the Great Basin and northwestern Colorado Plateau and could have supported a Paleo-Indian big-game hunting subsistence pattern. Schroedl clarified his use of the term as referring to a time period rather than to a specific lifeway.

The Archaic Period in the eastern Basin is seen as beginning around 8500 B.P with the shift being largely completed by 7500 B.P (Aikens and Madsen 1986, Grayson 1993, Haley 1994). Of the early Archaic, Aikens and Madsen (1986:155) noted, "the occurrence of sites over a range of altitudinal and topographical settings implies a roving pattern of hunting and gathering, in which settlements were seasonally occupied. There was probably a shifting balance between hunting and plant collecting at different times of the year, with upland sites mainly oriented to hunting and lowland sites mainly oriented to
### Figure 5  Summary of Great Basin prehistory

<table>
<thead>
<tr>
<th>Years</th>
<th>Period</th>
<th>General subsistence pattern</th>
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<tr>
<td></td>
<td>Protohistoric</td>
<td>influence of European contact</td>
</tr>
<tr>
<td></td>
<td>Late Prehistoric</td>
<td>hunting and gathering</td>
</tr>
<tr>
<td>1000</td>
<td>Formative (Fremont)</td>
<td>mixed: horticulture, hunting and gathering</td>
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<tr>
<td>A.D.</td>
<td>Archaic</td>
<td>hunting and gathering</td>
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<td>B.C.</td>
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<td>1000</td>
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<td>7000</td>
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<tr>
<td>8000</td>
<td>Paleo-Indian</td>
<td>mixed. big-game hunting, gathering</td>
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<td>12,000</td>
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Exploitation of upland zones appears to have continued to increase during the later Archaic. This shift in subsistence and land use practices may be linked to environmental changes (Grayson 1993). The end of the Archaic Period, and the beginning of the Formative Period, is marked by the advent of horticulture.
Corn and other cultigens appear in archaeological contexts in the southern Wasatch Plateau at a date of approximately 2500 years ago (Madsen 1989). Groups in the valleys both to the east and to the west of the Wasatch Plateau began to adopt cultivated plants and a more sedentary lifestyle by A.D. 400 (Madsen 1989). "By A.D. 800 settled Fremont culture horticultural village sites characterized by pit houses, above- and below-ground storage features and corn-beans-squash horticulture had begun to appear" (Aikens and Madsen 1986:160). Marwitt (1986:161) however noted that "hunting and gathering remained important economic activities for all groups during the entire span of the Fremont culture."

The Fremont, as a distinctive culture, disappear from the archaeological record of the Great Basin after A.D. 1250-1350 At White contact the Great Basin was inhabited by Numic-speaking peoples whose relationship to the Fremont remains unresolved (Marwitt 1986). These Numic peoples, including the Ute and Paiute of central Utah, followed a lifestyle based primarily on hunting and gathering.

The record of human occupation of the Wasatch Plateau appears to follow the general outline presented for the eastern Great Basin. A human presence in the mountains can be traced from the Paleo-Indian Period through the Archaic, Formative, Late Prehistoric, and Protohistoric periods (Aikens and Madsen 1986, Janetski et al. 1991, McDonald 1993, Schroedl 1976, Schroedl 1991). A lanceolate projectile point found in the vicinity of a nearly complete skeleton of a Colombian Mammoth hints at the presence of humans in the area as early as 11,200 years ago (McDonald 1993). Schroedl (1991) posed an interesting hypothesis that climatic changes at the beginning of the Holocene may have stimulated use of upland areas as both humans and animals moved to higher elevation "refugia". Clovis and Folsom points in Utah tend to occur at elevations below 6000 feet while later Paleo-Indian projectile point types, such as those of the Plano Tradition, are found at relatively high elevations. Schroedl believed the "refugia" hypothesis might
explain the Wasatch Plateau's Huntington Reservoir mammoth— which was found near an elevation of 9000 feet. Remains of two mastodons, associated with late Paleo-Indian materials and dating to 7000-7500 years before present, were also recovered from the Wasatch Plateau—at an elevation of 9700 feet. Schroedl (1991) noted that such "evidence of Pleistocene megafauna in the same environmental settings as fluted points suggests a subsistence strategy that involved big game."

A number of lithic scatters in the mountains of the Wasatch Plateau have yielded diagnostic projectile points representing the Archaic through Formative periods. The Late Prehistoric to Protohistoric periods are represented by "ephemeral" artifact scatters containing projectile points or ceramics (McDonald 1993). Malinowski and Haley (1993) reported an uninterrupted sequence of occupation from Paleo-Indian through Late Prehistoric. They also noted that later periods, those following the Archaic, are not well represented and raised the possibility that this is due to a change in subsistence patterns.

McDonald suggested that the upland areas were used primarily for hunting during the Archaic. The animals available at high altitude in the Wasatch Plateau include elk, deer, and mountain sheep; berries become available throughout the late summer and early fall. Water is available in a number of small glacial cirque lakes and the streams that drain from them. In addition, the Castle Dale chert formation serves as a locally available source of tool-stone. Janetski, Crosland, and Wilde (1991), in their excavation of a rockshelter situated at 8200 feet on the southern margin of the Plateau, hypothesized that the shelter was used as a residential location by Archaic hunters and gatherers and as a special use site by the Formative Fremont people. In both cases, hunting was an important component of the usage of the surrounding area. Slab metates from the Archaic level indicated the existence of a plant-processing component in the subsistence activities represented at Aspen Shelter.
High altitude research from elsewhere in Utah includes Janetski's excavation at Sparrow Hawk in the Oquirrh Mountains southwest of Salt Lake City. Sparrow Hawk is located at an elevation of approximately 8000 feet. Janetski (1985) interpreted the site as having been used primarily as a special purpose hunting location by both Archaic and Fremont populations. Projectile points far outnumber the groundstone and ceramic artifacts recovered at the site; the remains of large game, deer and mountain sheep, are well represented. The presence of groundstone implies that some plant processing activities also took place at Sparrow Hawk.

Simms (1979) interpreted high altitude sites in the Fishlake Forest, south of the Wasatch Plateau, as being related to either exploitation of specific resources or as locations along access corridors. Winter (1983:8) noted that “local groups may have moved up and down the elevational gradients in response to changes in resource availability.” DeBloois (1983) proposed three models for high altitude land usage: entire groups may have moved into the uplands on a seasonal basis, segments of a population may have exploited high altitude resources, or groups may have occupied the higher elevations on a permanent basis. DeBloois noted that historical evidence supports the first two models, but does not support a hypothesis of permanent occupation of high-altitude areas. Interestingly, DeBloois also noted that higher elevation Fremont sites show an “unusual” increase in the number of projectile points as compared to lowland sites (1983:67).

In contrast to these views of high altitude land use, excavations and surveys in the lowlands east and west of the Wasatch Plateau indicate that subsistence at lower elevations may have been dominated by a reliance on plant products. Lower elevations feature a pinyon-juniper zone, a variety of grasses and shrubs, and a greater number of frost-free days. During the Formative period, Fremont peoples began a transition to a greater reliance on plant products that culminated in the appearance of domesticated
plants and the apparent adoption of a horticultural way of life. As noted above, subsistence strategies at this time may have continued to involve short-term usage of upland areas for hunting or for relief from drought conditions (Simms 1986).
CHAPTER 4
Methods and Materials

Selection of Research Variables

Precipitation and faunal and floral resources vary with elevation; this variation influences the potential for varied subsistence practices within a relatively short horizontal distance. The Wasatch Plateau features elevations as high as 11,000 feet. This thesis will compare data from elevations in excess of 9000 feet and from lowlands below 7000 feet. These elevations present a convenient division: all of the timber parcels investigated during the 1996 South Manti survey, and much of the National Forest holdings on the Wasatch Plateau, fall above 9000 feet; large parcels of public lands adjacent to the Plateau lie at elevations below 7000 feet. Federal land-management policies drive much of the archaeology being performed in this country. Therefore, large public land holdings are likely to equate with large holdings of archaeological data. In addition, ecozones associated with these elevations are very distinct.

Precipitation and length of growing season vary with elevation and influence the species of plants and animals that are found within ecozones. The highest areas receive as much as 30 to 40 inches of moisture each year— one-third coming from summer rainfall; precipitation at lower elevations may be as little as eight inches or as much as 12 to 16 inches per year and is evenly split between winter and summer (Hauck 1977, Reed and Chandler 1984). Lower elevations experience a growing season of up to 140 days, the highest reaches of the Plateau may experience only 20 frost-free days in a year. This variation in availability of water and in the duration of the growing season influence the vegetation, and in turn the animals, prevalent at different elevations. In short, elevation
Figure 6. General area of project locations from which study data are derived. Adapted from Allison et al. 1997.
affects the resources that are available for human exploitation.

Hauck (1977) noted that the Upper Sonoran Zone extends to approximately 7500 feet in the study area. Jennings (1978) placed the division between the Upper Sonoran and Transition Zones at 7000 feet for Utah and the Eastern Great Basin. Pinyon and juniper woodlands dominate the Upper Sonoran Zone; the understory of sparse shrubs and grasses includes bitterbrush, squawbrush, mountain mahogany, scrub oak, galleta grass, cheat grass, Indian rice grass, prickly pear cactus, and Russian thistle (Allison et al. 1997, Hauck 1977). Open sage parks representative of the Big Sagebrush community are interspersed among the pinyon juniper woodlands. Rabbitbrush, horsebrush, winterfat, snakeweed, galleta grass, and blue grama grass join big sagebrush as members of this floral community. Elevations between 4000 and 6000 feet are dominated by the greasewood, saltbush, shadscale, blackbrush, and Mormon tea of the Desert Shrub community (Hauck 1977). Allison et al. (1997) noted that the boundaries of these three communities are not rigid and blend into each other. Pinyon, juniper, thistle, saltbush, big sagebrush, greasewood, snakeweed, shadscale, prickly pear, rabbitbrush, horsebrush, Mormon tea, galleta grass, Indian rice grass, and other grasses are known from archaeological contexts and ethnographic studies to have played a role in prehistoric and protohistoric economies as food, medicine, fuel, or in the formation of various material items (Janetski 1986, Jennings 1978, Winter and Hogan 1986).

The Transition Zone occupies elevations between 7500 and 9500 feet (Hauck 1977). The Transition Zone typically contains yellow pine or ponderosa pine forests with an understory of mountain muhly, mountain mahogany, serviceberry, bitterbrush, and other shrubs and herbs (Hauck 1977, Jennings 1978). The Canadian, or Spruce-Aspen Zone begins at approximately 8500 feet. Above 9000 feet lie the subalpine (Hudsonian) and alpine (Alpine-Arctic) zones (Jennings 1978). Elderberry, gooseberry, currant, western cornflower, Gambel oak, bitterbrush, lupine, and tar weed form the understory of
the subalpine and alpine ecozones of the Wasatch Plateau (Stoker et al. 1990). At these higher elevations groves of quaking aspen and conifers dominate. Mountain meadows feature a primary ground cover of sagebrush, wheat grass, blue grass, needlegrass, sedges, larkspur, and yarrow (Reed and Chandler 1984). Glacial cirque basins frequently hold small lakes and moist open meadows which provide reliable water sources and access to dense stands of grass for both human and faunal populations. Again, the importance of these floral resources stems from their use in prehistoric economies. Mountain mahogany provided both medicines and fuel; yarrow and larkspur served respectively as medicine and narcotic (Jennings 1978). Janetski (1986) notes an emphasis in the ethnographic records on the collection of berries in the late summer and early fall. Personal experience testifies to the abundant availability of currants in the high forests of the Wasatch Plateau during the late months of summer.

Biologists place the Wasatch Plateau and adjacent lands into the Colorado Plateau Faunal Area. Elk, mule deer, coyote, various foxes, bobcats, blacktail jackrabbits, cottontail rabbits, porcupines, ground squirrels, packrats, raptors, grouse, pinyon jays, and crows are among the animals found in the area (Allison et al. 1997, Reed and Chandler 1984). Larger mammals, including elk, deer, and moose, are more likely to be found at higher elevations, although they retreat to the foothills of the Wasatch Plateau for winter forage. Smaller mammals, reptiles, and birds were components of prehistoric subsistence patterns. The larger mammals are more typically associated with an Archaic lifeway, but were utilized throughout prehistory as well. The presence of Pleistocene mega-fauna exploited by Paleoindian peoples is known for high elevation sites on the Plateau.

The two regions defined in this study differ in the types and availability of food-related resources, but subsistence activities represent only a portion of a total land use system. The scheduling of subsistence-related activities may influence settlement or
mobility patterns. Effective temperatures and the availability of water also vary with elevation and may influence settlement patterns. The locations of other resources, such as material for stone tools, also influence patterns of land use. Cultural systems, and the archaeological record, are products of the articulation between environmental, technological, and social factors (Binford 1964, 1980).

The artifacts I selected for analysis were chosen primarily for their association with particular aspects of prehistoric land use. I also selected artifact types that I believed would be consistently identified and recorded. The format of the Intermountain Antiquities Computer System (IMACS) site form guided my choices: recorders are asked to provide specific information with regard to the presence of formal lithic tools, lithic reduction debris, ceramics, and groundstone. Experience narrowed my selection. I have found that particular classes of artifacts are ambiguously defined and variably applied. For example, the general artifact class of bifaces refers to any tool that has been worked on both sides. In my experience the term biface is not uniformly applied. While bifacial tools may provide insight into subsistence activities, it is difficult to determine from the term alone just what type of tool, or tool preform, the recorder is referring to. "Biface" as a category may include cores, scrapers, knives, or expedient flake tools. Kelly (1988b:731) concluded that bifaces could be used in "three different roles: as cores; resharpenable, long use-life tools; or as shaped, function-specific tools." Archaeologists may or may not recognize and record the distinctions between types of bifaces, or the roles they served, during fieldwork. On the other hand, the term "projectile point" refers to bifacially-worked tools that archaeologists generally separate out from the larger category of bifaces and identify as a distinct functional type.

The association of particular artifacts with specific activities or functions is not an exact process. The inference of function cannot be made on form alone, but is also
influenced by what Binford (1979) has called the "organization of technology". Mobility, planning, resource availability, and tool curation and reuse all affect the equation of form with function and with patterns of discard (Binford 1979, Kelly 1988b). Projectile points are typically associated with hunting, but may also serve as cutting or piercing tools in other contexts. Projectile points may enter the archaeological record at their point of use as a hunting tool or in a residential setting during maintenance or manufacture. I recognize that progressing from form to function, and from function to behavioral implications is a substantial leap of inference. However, I believe the literature supports the relationship of projectile points to hunting, cores and primary flakes with quarrying and initial lithic reduction, groundstone with plant processing, and ceramics with storage and as an indicator of a more sedentary settlement pattern.

Use-wear studies and testing of function through experimentation are two means of analyzing the possible uses of projectile points. Odell (1981.324) reflected that use-wear analysis had provided indications that "at least among certain cultures, the projectile-point group contains evidence of having been employed for multiple functions." However, Odell's own analysis of artifacts from a Dutch Mesolithic settlement did not support this view. Odell (1981) found that items morphologically classed as "points" were, on the basis of use wear, assessed to have functioned as "armatures" Frison (1991.318) concluded on the basis of experiments with large-animal butchering that "a projectile point is designed to penetrate, which requires symmetry in shape. The point and blade edges are sharp and strong in order to cut a hole large enough for the shaft to force the point into the animal far enough to cause a lethal wound. This kind of design does not make the optimum tool for most butchering purposes." Studies by Kelly (1988b) and Odell and Cowan (1986) support the association between projectile points and hunting and also indicate that other artifacts, such as unifaces and unretouched flakes, may have also served as projectile tips under certain circumstances.
I selected cores and primary flakes as indicators of quarrying and initial reduction of lithic materials. I use "quarrying" to refer to the procurement of toolstone from naturally-occurring outcrops or secondary surface deposits. One cultural resource management project report from which data for this study were drawn (Eccles et al. 1997:94) defined a core as "a piece of stone from which flake blanks are removed and fashioned into formal or informal tools". Barlow and Metcalfe (1993:36) defined core debitage as consisting of "blocky fragments of a toolstone that exhibit negative flake scars and may retain utilized platforms. Cores, core shatter, and core fragments represent early stages of toolstone production." Flakes removed from a core may be used "as is" as expedient tools, or may be further reduced into various tool forms. The initial flakes removed from a core typically retain portions of the cortex, or weathered outer surface, of the original stone. Such flakes are classified as primary or decortication flakes. Barlow and Metcalfe (1993, Metcalfe and Barlow 1992) provided discussions of the tradeoffs between field processing and transport of lithic materials and concluded that it is more efficient to remove and transport prepared flakes for later tool production than it is to carry large cores from which both flakes and waste material will be produced. Initial reduction of lithic materials is therefore assumed to take place at or near the source of the material. The inference is that cores and primary flakes will occur in greater proportions in debitage assemblages at or near a toolstone source as compared to assemblages in locations further removed from the source. Francis (1991), Kelly (1988b), Kuhn (1994), and Reher (1991) have noted that issues of mobility, overall resource-procurement strategies, and toolstone quality are among factors which add complexity to inferences regarding lithic procurement and utilization.

Groundstone artifacts are associated with plant-processing activities such as the milling and grinding of seeds and roots. Grayson (1993) equated an increased prevalence
of groundstone artifacts during the Archaic Period with a shift in subsistence to a greater reliance upon seeds and other plant materials. Ethnographic data, experimental efforts, and use-wear analyses support this association, although other uses of groundstone are recognized (Adams 1988, 1993). Groundstone tools may also have been used to grind clay for pottery, process hides, and to polish or smooth a number of materials (Adams 1988, 1989).

Finally, ceramic sherds are taken to indicate a less mobile pattern of land use and a more sedentary settlement pattern. Arnold (1985) examined this relationship through analysis of ethnographic data contained in the Human Relations Area Files. Arnold (1985 119) concluded that a "lack of sedentariness provides negative feedback for pottery making."

**Availability of Data**

"Section 106 of the National Historic Preservation Act of 1966, as amended, requires Federal agencies to take into account the effect of their undertakings on properties included in or eligible for inclusion in the National Register of Historic Places. " (Advisory Council on Historic Preservation 1996) Federal agencies such as the U S. Forest Service and the Bureau of Land Management have become primary generators and repositories of archaeological data. Archaeological surveys are conducted in advance of surface-disturbing activities that occur on federal lands or are funded by federal moneys: the first steps to assessing the effect of an undertaking on historical properties are to locate and evaluate those resources.

The archaeological data which served as the impetus for this thesis were generated by projects conducted for compliance with Section 106 requirements and in response to a proposed timber sale on the Manti LaSal National Forest. Reconnaissance of the timber sale units, all of which lay at an elevation in excess of 9000 feet, revealed a surprisingly
large amount of evidence for prehistoric human usage of these high altitude landscapes. "Sites" were defined and recorded as clusters of 15 or more artifacts. Isolated artifacts and features, as well as smaller clusters of artifacts, were recorded as "isolates". By the end of the 1996 field season, archaeologists had recorded a total of 22 sites in units associated with the South Manti timber sale. The 1996 field crew located 83 prehistoric "isolates", many of which consisted of more than one item. An interpretation of the archaeology of the area based solely on site data would exclude these artifacts and address only a portion of the record of prehistoric land use.

Initially, a second season of survey was planned. Budget considerations and changes in the timber harvest program on the Forest resulted in postponement of further work. A file search performed in the Forest Supervisor's Office in Price, Utah, provided additional data regarding the archaeological record of the Wasatch Plateau. A number of surveys have been performed on Forest lands at elevations in excess of 9000 feet.

The Bureau of Land Management oversees large parcels of public lands along the eastern side of the Wasatch Plateau. These lands typically lie at lower elevations than the forested crest of the mountains, and offer the comparative dataset. A file search in the Price River Resource Area Office, Price, Utah, revealed that a number of projects had been completed on lands at or below 7000 feet in elevation.

Data Collection

Archaeological reconnaissance (pedestrian survey) is typically accomplished by crews of 2 or more people performing visual inspection of exposed ground surfaces. The crew members array themselves at specified intervals, then maintain these intervals while traversing the area under examination. Transect intervals vary between agencies and contractors, but generally fall between 10 and 30 meters in width. Transect paths may follow compass headings, visual reference points on the horizon, or may be aligned with
the terrain. Crew members may follow a linear path along the transects, meander as needed to take in areas of greater surface visibility within the width of the transect, or may zig-zag in order to inspect the full transect width. When archaeological resources are encountered the crew records the items and maps the location.

The records of the Forest Service and Bureau of Land Management contain a number of projects completed by a variety of individuals and contracting firms. The projects are indexed by year, project number, and location on "base maps" Each agency uses a slightly different system and I relied on input from Stan McDonald, Manti LaSal Forest Archaeologist, and Blaine Miller, Price River Resource Area Archaeologist, to steer me towards projects suitable for this study.

Many projects report survey data gathered from inspection of small parcels of lands related to specific and limited undertakings such as a single well pad, transmission line, or pipeline. Obviously, projects limited in scope would provide limited numbers of artifacts for analysis. In addition, the practice of archaeology has changed through the years and data collection from more recent projects is generally considered to be more reliable and thorough. On the basis of these considerations, I chose projects that met the elevation requirements, reported artifact counts for both sites and isolates, involved evaluation of relatively large parcels of land, and had been completed within the past 15 years.

Sources of Error

A certain amount of variation in survey techniques occurs between agencies, between private contractors, and even between projects within the same agency. Transect widths of projects used in this study varied between 10 and 30 meters. Transect paths varied from straight line, to meandering, to zig-zag patterns. Surface visibility within
project areas can also be expected to vary: lower elevation desert scrublands include areas of exposed bedrock which offer 100% visibility. The forests and grassy meadows of the Wasatch Plateau feature dense vegetation which limits surface visibility. A number of the reports referred to areas where surface visibility fell to approximately 10%. Some projects report 100% coverage of survey units—indicating that the entire parcel was crossed by pedestrian transects. Other surveys exclude steep slopes from inspection, perform "cursory" inspections of such slopes, or attempt to inspect varied percentages of the landscape according to slope measures. For example, the 1996 South Manti project relied upon GIS data and a sampling strategy developed from previous surveys to determine completeness of reconnaissance: we sought to survey 100% of landforms with slopes less than 10%, 50% of landforms with slopes between 10 and 20%, and only 10% of areas with slopes in excess of 20%. Other factors which can influence the level of data recovery include variations that cannot be determined from project reports. These factors include the experience of crew members, effects of weather and lighting, and time constraints which influence the rate at which a crew progresses across the land.

On a concrete level, problems within the data set surfaced in the form of variation in how different researchers recorded artifact numbers. Originally the artifacts chosen for analysis included primary flakes as an indicator of the initial stages of lithic reduction. Initial reduction frequently occurs at or near the source of lithic raw materials. Primary flakes were to be considered, along with cores, as related to the presence of quarrying activities. However, not all researchers record the number of flakes by reduction stages. The Intermountain Antiquities Computer System (IMACS) site form, the form used by both federal agencies, calls only for a ranking of the relative occurrence of each class of flakes found on a site. Tables of isolates may report flakes as either primary, secondary, or tertiary, or may just record the total number and raw material types of flakes noted. As a result, I could not determine how many primary flakes had actually been recorded.
Archaeologists faced with very large sites, and operating under finite time limits, appear to resort to estimating the number of certain types of artifacts. Some of the site forms from which the study data is drawn reported artifact counts as ranges or as an estimated minimum: reports listed "10-25 pieces of ceramics" or "10+ pieces of groundstone". When confronted with data of this type I chose to use the minimum number given as representing the count for that artifact type.

I tallied the number of artifacts in each class from lists of isolated artifacts and site forms associated with the projects chosen for analysis. I performed a Chi-square analysis to either reject or support the null hypothesis. All calculations were performed by hand.
CHAPTER 5
Results and Discussion

I selected a total of nine project reports for analysis. Three projects (Allison et al. 1997, Black and Metcalf 1985, and Eccles et al. 1997), on file in the Price River Resource Area office of the Bureau of Land Management, met the specifications of elevation less than 7000 feet, recent project completion date, and large number of acres surveyed. These reports contain data from a total of 5733 acres of survey. Six reports from the Manti-LaSal National Forest records fit the criteria regarding date and size of project and contained survey data from lands above 9000 feet (Blackshear 1994, Blackshear 1998, Brown et al. 1992, Haley 1994a, McDonald and Blackshear 1996, and Stoker et al. 1990). These projects account for a total of approximately 5950 acres of survey. Transect intervals used in projects completed for the Bureau of Land Management varied from 15 to 30 meters in width. Transects used in Manti LaSal Forest projects varied from 10 to 20 meters in width.

<table>
<thead>
<tr>
<th>Project</th>
<th>Elevation</th>
<th>Acres surveyed</th>
<th>Transect width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison et al. 1997</td>
<td>&lt;7000, &gt;5800</td>
<td>2003</td>
<td>30 m</td>
</tr>
<tr>
<td>Black and Metcalf 1985</td>
<td>&lt;7000, &gt;5000</td>
<td>2400</td>
<td>15 m</td>
</tr>
<tr>
<td>Eccles et al. 1997</td>
<td>&lt;7000, &gt;5600</td>
<td>1330</td>
<td>15 m</td>
</tr>
<tr>
<td>Blackshear 1994</td>
<td>&gt;9870, &lt;10,200</td>
<td>497</td>
<td>20 m</td>
</tr>
<tr>
<td>Blackshear 1998</td>
<td>&gt;9000</td>
<td>1464</td>
<td>20 m</td>
</tr>
<tr>
<td>Brown et al. 1992</td>
<td>&gt;9000</td>
<td>1183</td>
<td>20 m</td>
</tr>
<tr>
<td>Haley 1994a</td>
<td>&gt;9000</td>
<td>800</td>
<td>10 m</td>
</tr>
<tr>
<td>McDonald and Blackshear 1996</td>
<td>&gt;9000</td>
<td>1437</td>
<td>20 m</td>
</tr>
<tr>
<td>Stoker et al. 1990</td>
<td>&gt;9600, &lt;10,600</td>
<td>569</td>
<td>20 m</td>
</tr>
</tbody>
</table>
The numbers of artifacts located during survey are listed, by project, in Table 2. In some instances, especially when recording sites with large numbers of artifacts, report authors did not provide a specific count for a particular class of artifact. The most common method of dealing with large numbers was to provide a range or estimate of the total count. The minimum number given was used for purposes of analysis. For example if a site form recorded "20-25 ceramic sherds", the number of sherds for the site was recorded as 20. A single artifact was tallied when the recorder noted "several" of a particular type of artifact or commented that representatives of a class were "present". These types of estimations most commonly affected the counts provided for groundstone and ceramic assemblages.

The methods of recording primary flake data varied greatly between reports. Some site forms noted that primary flakes were "present" but did not provide an actual count. The IMACs form uses ranking system for recording the proportions of flakes

Table 2. Artifact numbers by type and project.

<table>
<thead>
<tr>
<th>Project</th>
<th>Elev</th>
<th>ppts</th>
<th>cores</th>
<th>gstone</th>
<th>ceram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison et al. 1997</td>
<td>&lt;7000</td>
<td>11</td>
<td>7</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>Black and Metcalf 1985</td>
<td>&lt;7000</td>
<td>19</td>
<td>11</td>
<td>19</td>
<td>221</td>
</tr>
<tr>
<td>Eccles et al. 1997</td>
<td>&lt;7000</td>
<td>20</td>
<td>21</td>
<td>19</td>
<td>67</td>
</tr>
<tr>
<td>Blackshear 1998</td>
<td>&gt;9000</td>
<td>11</td>
<td>21</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Blackshear 1994</td>
<td>&gt;9000</td>
<td>2</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown et al 1992</td>
<td>&gt;9000</td>
<td>7</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haley 1994a</td>
<td>&gt;9000</td>
<td>7</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>McDonald and Blackshear 1996</td>
<td>&gt;9000</td>
<td>6</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stoker et al. 1990</td>
<td>&gt;9000</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
found in a site, but does not call for an actual tabulation of numbers of each type of flake. Isolate tables typically recorded number and material type of flakes, but frequently did not note whether the flakes were primary, secondary, or tertiary. For these reasons I excluded primary flakes from the analysis.

Artifact totals grouped by type and elevation form the data presented in Table 3. Row and column totals are provided. Expected values for each cell are noted in parentheses. Results of Chi-square analysis are: $x^2 = 207.815$, $df = 3$, $p < 0.05$. The null hypothesis, which states that no difference in artifact proportions will exist between regions, is rejected. I conclude that there is a predictable relationship between proportions of artifact types and where they are found and infer that prehistoric land use patterns in the high elevation landscapes of the Wasatch Plateau differed from land use patterns at lower elevations.

<table>
<thead>
<tr>
<th>Elevation</th>
<th># ppts</th>
<th># cores</th>
<th># gstone</th>
<th># ceram</th>
<th>Row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;7000</td>
<td>50</td>
<td>39</td>
<td>63</td>
<td>292</td>
<td>444</td>
</tr>
<tr>
<td></td>
<td>(72.90)</td>
<td>(74.55)</td>
<td>(53.02)</td>
<td>(243.54)</td>
<td></td>
</tr>
<tr>
<td>&gt;9000</td>
<td>38</td>
<td>51</td>
<td>1</td>
<td>2</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>(15.10)</td>
<td>(15.45)</td>
<td>(10.99)</td>
<td>(50.46)</td>
<td></td>
</tr>
<tr>
<td>Column totals</td>
<td>88</td>
<td>90</td>
<td>64</td>
<td>294</td>
<td>536</td>
</tr>
</tbody>
</table>
Examination of the Chi-square table reveals that observed values for projectile points and cores at low elevations fall below expected values. Observed values for groundstone and ceramics exceed expected values. The reverse is true for high elevations: projectile points and cores occur in greater numbers than expected; groundstone and ceramics occur less frequently than expected. Low elevation artifact numbers support a conclusion that plant-processing, storage, and sedentary settlement were of greater importance than hunting and quarrying activities. Artifacts recorded at high elevations indicate that hunting and quarrying activities played a proportionally larger role in the subsistence and land use practices on the Wasatch Plateau.

Discussion

Cultural resource inventory reports (Brown et al. 1992, Haley 1994b, McDonald 1993) of the high altitude landscapes of the Wasatch Plateau noted a predominance of projectile points and other lithic artifacts and a relative absence of architectural features and groundstone artifacts. "Lithic scatters" are the most commonly recorded site type. The authors interpreted these findings as indicating that the area has been used primarily as a hunting locale. Gathering of plant materials is considered to be a possible additional use. McDonald (1993) and Barlow and Metcalfe (1993) also remarked upon the presence of Castle Dale chert both as it occurred in the Flagstaff limestone and as it appeared in archaeological assemblages and added quarrying of this material to the list of land use related activities common to the higher elevations.

Are these high altitude land-use patterns distinctive from patterns seen at lower elevations? Precipitation, frost-free days, animal and plant resources all vary with altitude. Variations in land use patterns could be expected to follow from this. Cultural resource inventories of lands adjacent to and at least 2000 feet lower than the crest of the Wasatch Plateau also list lithic scatters as the most common site type (Allison et al. 1997, Eccles et
al. 1997). These documents record camps and lithic/ceramic scatters as well. Hunting, gathering, long and short term occupation, and quarrying are all considered as components of the land use patterns common to these landscapes. Comparisons of the relative prevalence of specific land use activities in each region were not made.

I completed an analysis of the proportions of artifact types to total artifacts found in each elevation category. The resulting value for Chi-square indicated that the null hypothesis should be rejected and supported a conclusion that land use patterns were different at high elevations as compared to lower elevations. Examination of the expected and observed values for each artifact class indicate that hunting and quarrying probably were the primary activities at higher altitudes. Plant processing and longer-term habitation of camps appear to have been the dominant activities at lower elevations.

These results are expected given the interpretations of land use patterns available for the Great Basin from both archaeological and ethnographic sources. Diversity within a general framework is a hallmark of Great Basin cultural adaptation. Fowler (1982:134) noted that while specific behavioral patterns may have varied throughout the Great Basin, "Steward's (1938) generalized model of settlement patterns and subsistence practices closely tied to environmental settings is certainly valid." Human groups shifted emphasis among available resources within a generalized hunting and gathering pattern throughout Great Basin prehistory. Paleo-Indian populations may have been less dependent upon big game and more dependent upon plant resources than their contemporaries in other cultural areas such as the Plains. A hunting and gathering lifestyle is accepted as the distinguishing characteristic of the Archaic cultural period but, in the eastern Great Basin, the Formative Fremont continued to adhere to a hunting and gathering pattern even as they began to rely upon domesticated plants. Stewart (1966) noted that the Protohistoric Utes of eastern Utah followed the same general "Desert Culture" hunting and gathering pattern. Jennings (1978:245) characterized the Great Basin subsistence and settlement pattern as "a
flexible, highly adaptive lifeway" that followed a "seasonal, well-scheduled harvesting of both plants and animals."

Finally, the author's experience as a member of a survey crew underscores the difference between high and lower elevation environments and subsistence, settlement, and resource procurement opportunities. We were unable to begin our survey project before mid-June due to the amount of snowpack present above 9000 feet; the field season ended in mid-October due to weather concerns. During the summer months the days were pleasant, but cold mornings attested to the extreme variation in temperatures possible at that elevation. Throughout the summer our crew encountered game animals, specifically elk and deer, during our survey sweeps. We observed a correspondence between the timing of plant resource maturation and elevation and noted that an extensive berry crop matured late in the summer along the crest of the mountains. We additionally observed that the lower elevations were subject to uncomfortably high summer temperatures. Observation as well as archaeology support McDonald's (1993) conclusion that prehistoric populations probably followed a pattern of seasonal mobility and primarily used the upland areas for hunting and limited plant gathering during the months of summer and early fall.
CHAPTER 6
Summary and Conclusions

While the stated purpose of this thesis was to test a hypothesis regarding prehistoric land use practices, two other goals were also achieved. One goal was to employ a non-site approach to archaeological data collection and interpretation. The other goal was to tap the growing body of data coming from federally-sponsored cultural resource inventories.

The high altitude data used in this thesis come primarily from projects performed on National Forest lands. The lower elevation lands fall under the supervision of the Bureau of Land Management. Most inventories of federal lands represent "compliance" work: surveys performed in order to identify and evaluate cultural resources in areas planned for development. McDonald (1993) summarized the available Forest data and presents a "preliminary view of Archaic use of the Wasatch Plateau uplands", but such examples of synthetic efforts rising out of compliance projects tends to be the exception rather than the rule. Comparison of data between agencies occurs even less often. My application of a non-site approach provides a way to compare data between federal agencies as well as environmental regions.

Non-site Approach

The effectiveness of the non-site approach employed in this thesis is difficult to evaluate. The approach allowed each artifact to contribute to the overall picture of land use in differing environments. The volume of data generated through application of this approach argues for its continued application. A large number of artifacts were recorded as
isolates. The non-site approach preserves information that may otherwise be lost from analysis and interpretation (Table 4). Since projectile points provide temporal information, it is fairly standard to note the number and type of projectile points located during an inventory regardless of whether they are found in a site context or as an isolate. The same may be said for ceramics when the sherds can be associated with a temporally significant type. The total number of cores or pieces of groundstone is rarely featured in a final report. Their presence is noted; their relative abundance goes unmeasured. In addition an interpretation based on consideration of the number and relative abundance of the artifacts themselves, as compared to interpretations based on simplified site types such as lithic scatter or camp, provides a clearer picture of the actual land use practices that occurred.

Table 4. Comparison of artifacts recorded as isolates versus artifacts recorded from site contexts.

<table>
<thead>
<tr>
<th>Context</th>
<th># ppts</th>
<th># cores</th>
<th># gstone</th>
<th># ceram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolates</td>
<td>33</td>
<td>25</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Sites</td>
<td>54</td>
<td>62</td>
<td>61</td>
<td>290</td>
</tr>
</tbody>
</table>

The non-site approach I employed in this thesis differs in two primary ways from other applications of non-site archaeology. I chose to work with an already existing dataset consisting of observations made during standard site-based cultural resource inventories. Typically transect intervals used in non-site approaches are much more narrowly spaced than those used in CRM projects. Wandsnider and Camilli (1992) note that the structure of the inventory, in terms of transect intervals and expectations, may condition the types of observations made. If transects are wide, a lower recovery rate for
smaller items or clusters may be expected. Also, if surveyors are looking for sites, they tend to find sites.

The non-site approaches employed by Thomas, Ebert and others focus on the locations of individual artifacts within defined regions. Ebert's (1992) research in Wyoming involved detailed mapping of each identified artifact in three dimensions. I have compared the distributions of artifacts between two regions. I emphasize relative proportions of artifact types rather than specific locations.

While not a "typical" non-site approach, I believe my research demonstrates the potential advantages of thinking outside the boundaries of site-based archaeology. The approach provides a means to make comparisons between two separate bodies of data and between land use patterns in two different regions.

**Recommendations for Further Research**

The necessary exclusion of primary flakes from the analysis illustrates one of the problems inherent in using someone else's data: different people record different attributes of artifacts. In addition, variations in survey parameters between contractors and agencies decreases the comparability of the data between inventory reports. This research raised my awareness of the inconsistencies in "how" we do archaeology. Efforts at comparison across federal boundaries and between differing contractors would benefit from an exploration of how variation in survey parameters affects data collection. The discipline as a whole would benefit from a concerted effort to standardize data collection methods.

A number of interesting observations came to light during this project. Blackshear (1998) and McDonald (1993) both noted an apparent association between site locations on the Wasatch Plateau and the boundary between the North Horn Formation and the Flagstaff Limestone formation. Their tentative interpretation of this phenomenon centered on the presence of Castle Dale chert in the Flagstaff Formation. My observations during
survey raise the possibility that the association of sites with this boundary may also be related to its role as a boundary between ecotones. My sense is that the boundary between these two geological formations coincides with a topographic change from steep slopes and cliffs of limestone to glacial basins and gentler slopes and a vegetative change from alpine exposures to wet meadows and more heavily forested areas. Perhaps a non-site analysis of the types of artifacts occurring along this boundary may provide insight into the activities that are represented along this boundary.

Hauck (1992) noted an association between occupation patterns in portions of the Wasatch Plateau and specific topographic features. He commented that the majority of sites in the East Mountain and Trail Mountain areas appear to be related to the presence of springs and narrow ridges. He associated these topographic features with the movement of game through the area and remarked that it appeared that "ancient trail systems [are] still being utilized as game trails" (Hauck 1992:27). Blackshear (1996) speculated on the possibility of an association between archaeological resources and areas identified as elk bedding locales. If hunting is indeed a primary usage of high altitude regions, investigation of the relationships between game trails and other factors associated with animal behavior offers an opportunity to explore the hunting techniques and preferences of prehistoric peoples.

These types of investigation follow the approach presented in this thesis of comparing and contrasting archaeological data according to environmental factors. New technologies such as GIS will make finer-grained investigations possible. The interdisciplinary approach of federal agencies also holds a potential for synthesis of environmental, geological, animal behavior, and archaeological data. Variations in elevation, as investigated in this thesis, serve as a type of "short-hand" for more subtle changes in topography, temperature, water availability, vegetation, and animal species prevalence.
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