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## 5. Hunter-Gatherers in Jackson Hole, Wyoming: Testing Assumptions About Site Function

*Kenneth P. Cannon, Dawn R. Bringelson, and Molly Boeka Cannon*

**Abstract:** The settlement-subsistence pattern of hunter-gatherers in Jackson Hole, Wyoming, has been viewed historically as an economic system organized around the altitudinal distribution of seasonally ripening food crops and has come to be known as *high country adaptation* (HCA). Although this study does not take issue with the basic tenet of the model—hunter-gatherer movement through altitudinal zones for the exploitation of seasonally available resources—we critically assess the normative functional interpretations presented by previous investigators. We examine the artifacts in three lithic assemblages from southern Jackson Hole in terms of the organization of technology as a means to investigate each locale's function in a larger settlement system. By focusing on smaller units of analysis, and using different kinds of data, we are able to test expectations based on the HCA land-use model for each assemblage. We find that conclusions based upon that model are not consistently supported.

The archaeology of hunter-gatherers in high-altitude settings has only recently received the attention of researchers (Madsen and Metcalf 2000), despite evidence of long-term occupations (Frison 1991; Husted and Edgar 2002; Wedel et al. 1968) and arguments for in situ cultural developments (Black 1991; Husted 2002). Many of those studies have focused on how the mountains were integrated into a larger settlement system that included low-lying basins and valleys (e.g., Bettinger 1991), while others have sought to address site-specific topics (e.g., Larson et al. 1995).

For decades archaeologists have sought to use artifact form and the reconstruction of lithic tool-manufacturing processes to understand the organization of hunter-gatherer societies. Individual lithic artifacts were described

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with that intent nearly 40 years ago (Binford and Quimby 1963; Crabtree 1972). More recently, assemblage-level descriptions with similar purpose have become numerous (e.g., Beck et al. 2002; Goodyear 1993; Johnson 1986; Stelten et al. 1998; Teltser 1991). Binford (1979) introduced concepts that stimulated organization of technology studies over 20 years ago, and that discussion continues today. He used an ethnographic forum to introduce concepts for developing expectations for lithic-assemblage structure under varying conditions of settlement mobility and resource procurement. The concept central to his discussion was curated vs. situational technology; that is, "passive" vs. "active" gear. He outlined active gear as that which is in current and regular use and passive gear as that which is cached, or stored for use during specific points in the annual cycle. Additionally, he distinguished passive gear from "insurance gear," or that which is also cached, not for use during any particular season but in case of unanticipated need (Binford 1979:257).

In order to understand what activities were conducted at various sites, and thereby develop a functional model of each site's role in the settlement system, we must be able to demonstrate the functional relationship between the recovered material remains and human behavior (Binford and Binford 1966). In the Binford's work, functional properties of tools were stressed, and their distribution and variation across the landscape were interpreted as reflections of human functional and adaptive behavior (Shott 1989). Interpretations of human behavior, it was argued, could be made by examination of the material record. For example, it was reasoned that specific behaviors such as hunting would produce a different assemblage from one used in the consumption of the hunted game.

Since the publication of the Binford's functional model, archaeologists have demonstrated the utility of debris analysis for understanding not only the technology of lithic reduction but also for understanding how sites functioned within a larger settlement system. It then follows that in order to address the larger issues of cultural patterning, postfield analyses should consider to some degree the evaluation of the reduction sequence represented (Boney 1983). In our study we discuss the research approach we developed in the analysis of lithic debris and applied to the testing of a high-altitude settlement-subsistence model proposed by Gary Wright and his students (Bender and Wright 1988; Wright 1984; Wright et al. 1980), which is known as the *high country adaptation* (HCA) for northwestern Wyoming (Figure 5-1).

### High Country Adaptation

Following nearly a decade of research in northwestern Wyoming, Gary Wright and his students developed their settlement-subsistence model for Jackson Hole. Their model considered the altitudinal zonation of ripening plant foods as the driving force behind population movements, with other resources such as lithic procurement and hunting and fishing of secondary importance.

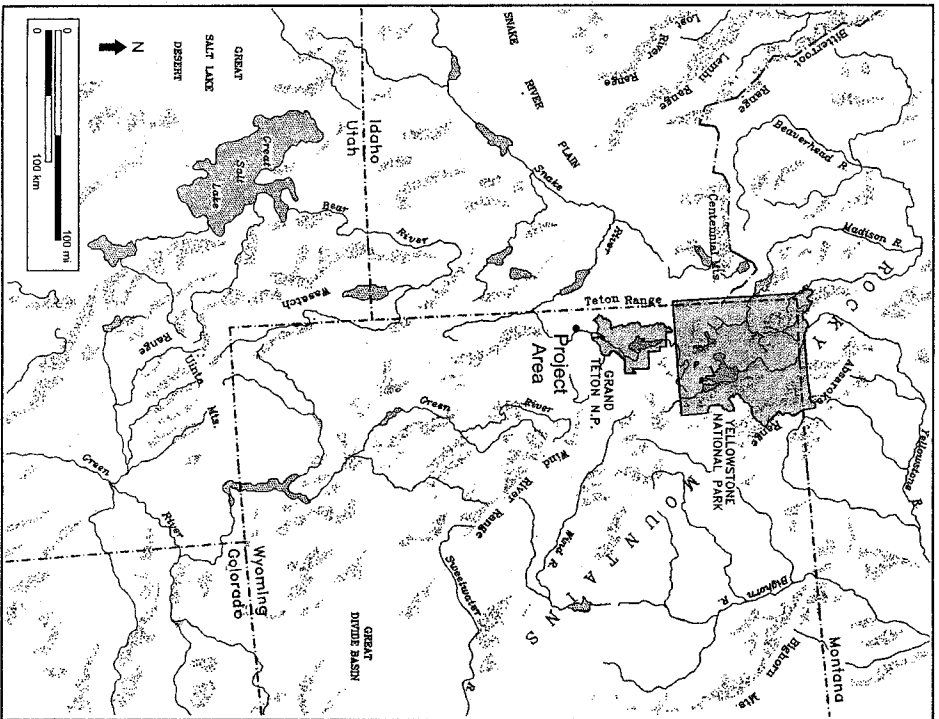


Figure 5-1. Location of the project area in northwestern Wyoming.

Archaeologists from the State University of New York-Albany conducted their most extensive work in northern Jackson Hole (Bender 1983; Reeve 1986) and provided Wright and his students with the best evidence for developing the model. According to that model, in late spring, groups moved toward northern Jackson Hole from winter hunting territories in Idaho. That migra-

tion took place via what is now southwestern Yellowstone National Park along the Falls River. Next, movement was south over a low divide and down Glade Creek to the Snake River and eventually to the Lawrence site (48TE509) at the north end of Jackson Lake. It was there that a second harvest of the blue camas meadows occurred. With the ebbing of plant crops on the valley floor, groups began migrating into the northern Teton via Berry Creek, Conant Pass, or Jackass Pass. Taking advantage of late-summer harvests in the high country also brought hunting bands within the ranges of large-game animals (e.g., mule deer, elk, and mountain sheep). With the shortening days of autumn, migration downslope and west toward the winter hunting territories completed the annual cycle (Wright et al. 1980:190–191).

Bender and Wright (1988:626) provided an updated version of the model emphasizing a diversified resource base and proposed that “prehistoric hunters and gatherers seasonally scheduled occupations of mountainous areas in order to procure the wide variety of resources available there.” The updated version also provided information on how the prehistoric settlement patterns would be expressed in the archaeological record.

The authors present their posited settlement pattern in the form of three types of sites: base camp, secondary base camp, and special-use site (Table 5-1). The base camp serves as a relatively long-term, permanent central point for all community members. Bender and Wright (1988:627–628) define these sites as large in area (to accommodate the largest number of people), with large quantities of artifacts (having hosted the greatest amount of activity—all group members used the locales, and the locales were reoccupied). In addition, the authors require that base camps be located in areas with high accessibility and habitability values. In other words, they must be easy to reach from multiple directions and must be in relatively comfortable areas (sheltered, close to water, etc.).

The secondary base camp (SBC) is described as a “spin-off of procurement activities” (Bender and Wright 1988:630) from the base camp, formed when cost of travel between immobile resources and base camp is too high to return on a daily basis. SBCs are defined as the focus of diverse activities for a smaller number of people and a shorter period of time, with no necessary re-occupation. Therefore, archaeological materials do not cover as large an area as do base-camp assemblages, and quantities are also lower. Finally (in contrast to base camps) secondary base camps are, by definition, located in proximity to immobile (presumably plant but potentially toolstone) resources; habitability and accessibility are not a necessity (Table 5-1).

Bender and Wright (1988:627–628) describe special-use sites (SUS) as the residue of logistic forays for specific resources: immobile ones, such as toolstone; and mobile ones, such as large-game animals. Short-term occupation leads to the conclusion that such sites are small. Quantity of materials may vary for SUS; immobile resource sites are expected to be reoccupied, and re-occupation may result in large quantities of debris, while mobile resource-extraction sites are not necessarily reoccupied and may be represented by very few artifacts.

**Table 5-1. Characteristics Used to Form Hypothetical Interpretations About the Wilson-Fall Creek Road Assemblages**

Site-Type Interpretation	Location	Site Area	Assemblage Size
Base Camp	Habitable and accessible	Large	Large
—Long-term, repeat occupation			
—Used by whole group			
Secondary Base Camp	Adjacent to immobile resources (e.g., plant communities, lithic resources)	Moderate	Moderate
—Varied occupation			
—Fewer members			
Special-Use Site	Variable—if extraction site, will be adjacent to resources; if for hunting mobile game, will be adjacent to migration routes or feeding areas	Small	Variable, depending on reoccupation history
—Short-term occupation			
—Small group of users			
—Repeated occupation, if immobile resource			

Source: Derived from Bender and Wright (1988).

### A Critical Assessment of High Country Adaptation

The high-altitude studies by Wright and his students provided the first systematic studies of the archaeological record of northwestern Wyoming, but they also left us with a biased and possibly incorrect interpretation of the archaeological record. The model offers a simplistic view and does not address variability in behavior or changes through time. The overriding assumption that Wright and his students (Bender and Wright 1988; Wright et al. 1980; see also Connor 1998) make is that site function *does not change through time*; each “site” represents an internally homogeneous unit. For example, Wright, Bender, and Reeve (1980) define base camps as being greater than 5,000 ft<sup>2</sup> with a wide range of tool types. This definition does not take into consideration reoccupation of a site (such as a quarry site that would fit the definition of a SUS) over a period of years and the possibility of changes in site function through time. While they make mention of this effect (Bender and Wright 1988:629), it is not incorporated into their interpretation. As Binford (1983) has argued, in order to understand prehistoric settlement-subsistence patterns, it is necessary to determine the function of each site

based on the critical analysis of the remains. As such, site function is determined based on the functional identification of the activity areas. Once site function is demonstrated for a representative sample of sites, regional patterns will become evident, allowing archaeologists to characterize prehistoric settlement and subsistence behavior.

Another important aspect of Bender and Wright's (1988) interpretation is that interpretive units are the same as analytic units, thus setting up a tautological argument that becomes self-fulfilling. In our evaluation of their work, we found that site rank is used to define site function but is based solely on site size. In addition, we would stress that the site types proposed by various authors represent idealized functional classes, while in reality, assemblages are compilations of material deposited over various lengths of time, representing perhaps many functionally diverse activities. Archaeological assemblages are unlikely to fit neatly into one or another functional class. As archaeologists, we should strive to examine the variability between and within assemblages so that we can ultimately make (reasonable) statements about whether, and how, the data support the land-use models described.

We argue the HCA "model" is conjectural, having been developed ad hoc following information collected through limited site testing and survey during the 1970s and into the 1980s. Explicit survey methods are not discussed but probably consisted of an opportunistic, nonprobabilistic sampling strategy (Asch 1975). In any case, the intensity of coverage is difficult to assess. Although probably an appropriate strategy for Wright, especially when one considers that little was known about the area and that funding was limited, it does present a biased view of the record. For example, are the sites used in the study representative of the entire range of the archaeological record in the northern Teton, or are they merely the most visible? It is important to recognize that no formal model development or testing program was articulated.

As Bender and Wright (1988) and others (e.g., Benedict 1999) have noted, the zonation of resources in the mountains is an important key for understanding settlement. This is evident not only in the seasonal availability of resources but also in the diversity provided by the altitudinal gradient over relatively short distances.

Like much of Wyoming, varied topographic features and vast differences in elevation characterize Jackson Hole. From the valley floor at an elevation of 1,920 m (6,300 ft), the Teton rise over 2,200 m (7,200 ft) in only a few kilometers. Since, within this lateral and vertical distance, there are a number of life zones, a considerable variety of plants and animal species exist in relatively close proximity to each other (Clark 1999). Many of the species are confined to one zone or other; yet many more range through several of the zones on annual or seasonal cycles. For example, large-game mammals such as elk seasonally migrate from the winter range on the floor of Jackson Hole up through higher elevations as snows retreat and vegetation ripens (Cole 1969). Importantly, Bender and Wright (1988:626) note "the effects of elevational differences on local climate are such that high-country resources generally become available just as their lower elevation counterparts pass out of season."

Seasonal availability of lithic resources may also be a factor. For example, several sources of volcanic glass lie at elevations that make them accessible for only short periods of time (e.g., Obsidian Cliff [48YE433] lies at an elevation of nearly 2,438 m; Love Quarry [48TE960] on Teton Pass is at an elevation of 2,570 m), although downslope deposits, such as those at the Crescent H Ranch (48TE1079) at an elevation of 1,868 m, are available for longer periods of the year.

In sum, applications of the HCA have provided much potential information about the hunter-gatherer record of Jackson Hole and beyond. Unfortunately, shortcomings in the scheme create a picture of the past that is likely to be overly simplified and, with published data, is thus far untestable.

### Developing Tenable Methods for Examining the Record: A Case Study

The Wilson-Fall Creek Road (WFCCR) archaeological investigations were part of the Section 106 compliance process for the reconstruction of Wyoming Forest Highway 21 in southern Teton County by the Federal Highway Administration. Initial archaeological investigations were conducted in 1987 (Iltis et al. 1987) and were followed by data-recovery investigations by the National Park Service's Midwest Archaeological Center in 1998 (Cannon et al. 2001). This project provides an excellent opportunity to examine the applicability of the HCA to intermountain assemblages.

#### Local Site Context

The three WFCCR sites are situated along Fall Creek near Wilson, Wyoming (Figure 5-2). The Fish Creek Ranch site (48TE1077) lies at the mouth of Black Canyon Creek. Migration of the main channel of Black Canyon Creek in the late Holocene and trimming back of the terrace by Fish Creek account for the current landform morphology. During the postglacial era a reduction in stream competency occurred, transport of gravels eased, and overbank and sheetwash prevailed. Archaeological occupation occurred during that period (Eckert 2001).

The Crescent H Ranch site (48TE1079) is located about 1.6 km south of 48TE1077 and is situated at the mouth of an unnamed drainage informally known as Obsidian Hill Creek. Obsidian Hill Creek (OHC), a first-order, east-flowing, intermittent stream, heads in the Snake River Range at an elevation of about 2,591 m and debouches onto the postglacial floodplain of Fish Creek. Prior to the last deglaciation, Snake River outwash aggraded to near the level of the present Fish Creek floodplain. OHC drains an area composed of pre-Tertiary sedimentary rocks veneered with pre-Wisconsin glacial drift and a Tertiary rhyolite flow. Part of the Tertiary rhyolite forms "Obsidian Hill," named for its abundance of obsidian clasts (Cannon et al. 1999; Eckert 2001).

Presently, the distributary channel near the southeastern margin of the fan provides a topographic boundary for two portions of the site. The northwestern portion of the site consists of redeposited loess overlying red gravel units

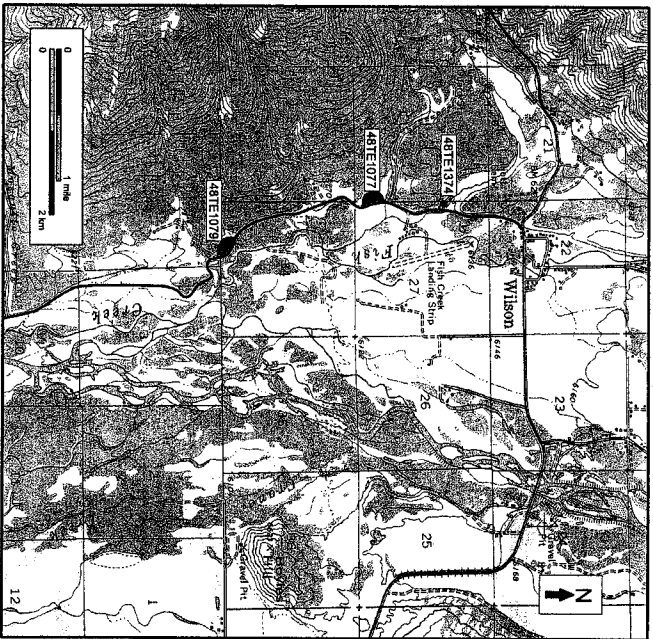


Figure 5-2. Project area in southern Jackson Hole, Wyoming, illustrating the Wilson-Fall Creek Road sites discussed in the text.

that were probably emplaced as stream deposits under Pleistocene flow regimes. Obsidian cobbles are interspersed with clasts derived from the sedimentary bedrock. The archaeological materials in this portion of the site lie within an overlying sheet of silt that includes a high proportion of redeposited loess, some sand and pebbles, and an occasional debris flow. The sheetwash sediments aggraded over a partly dissected Pleistocene alluvial fan that had formerly prograded onto the floodplain of Fish Creek. Fish Creek has trimmed back that alluvial fan, revealing the postglacial sheetwash sediments overlying the Pleistocene gravel in a cutbank. This suggests that the trimming occurred as a late Holocene event after the sheetwash sediments were deposited (Eckertle 2001).

The geomorphic history of the Burchardt site (48TE1374) is similar to that of the Fish Creek Ranch site. The landform is probably an alluvial terrace created from the deposition of sediments by the meandering of Trail Creek. Abandonment of that elevation by Trail Creek probably occurred in the late Holocene, followed by truncation of the landform by Fish Creek. However, bioturbation blurred sediments in those strata, complicating geomorphic reconstruction ef-

forts. Colluviation may be a component of sediments as indicated by the thickening of the basal gravel zone toward the valley wall. Alternatively, sedimentation may be the result of loess and slope wash (Eckertle 2001).

#### *Wilson-Fall Creek Road Site Descriptions*

Archaeological materials recovered from the Fish Creek Ranch site consist almost exclusively of obsidian debitage (total artifact count is 16,227). No evidence of features or fired rock was recovered. Unmodified cobbles of obsidian were found in the lag deposits, as well as in the gravels of Black Canyon Creek. Based upon this information, our working model for the site is that it functioned as a SUS at which lithic procurement and bifacial reduction were the main activities.

Excavations at the Burchardt site produced 19,088 pieces of debitage. Based upon the preliminary analysis of the recovered materials, the site's location in an ecotone, its accessibility, and the presence of a variety of features and artifact classes, we hypothesize that the Burchardt site represents a base camp at which a wide variety of activities were conducted.

The Crescent H Ranch site produced the most extensive artifact assemblage of the three sites investigated, and possibly of any site investigated in Jackson Hole. The debitage assemblage exceeds 170,000 specimens from deposits that span the Holocene (Cannon et al. 2001). Our preliminary assessment is that it represents a lithic procurement (and reduction) locale where several other activities also occurred. The full range of biface production present and additional tools and features indicate other activities were also being conducted. The characteristics of the Crescent H Ranch site, including accessibility, ecotonal setting, large size and large artifact assemblage, suggest it may fit within the category of base camp.

Blocks excavated west of Obsidian Hill Creek (hereafter referred to as northwest 1079) are considered separately from those excavated east of the creek (southeast 1079). Those areas are different in geomorphology (Cannon et al. 1999) and, based upon field analysis of the artifacts, appear to represent areas that also supported different activities. For example, Block B (in northwest 1079) produced flaking debris, cores, and hammerstones, suggesting that lithic reduction was the predominant activity conducted (Figure 5-3). Conversely, we discovered various tools and a feature in Block E (southeast 1079), as well as lithic-reduction debris, suggesting a wider range of activities was conducted in that portion of the site (Figure 5-4).

#### **Methods: Using a Materialist Approach to Examine the Record**

##### *Expectations and Logic: Behaviors and Material Correlates*

As discussed above, the WFCR project provided an opportunity to evaluate the HCA with data from an intermountain lithic assemblage. Our examination here is based on the dimensions of assemblage diversity, range of reduction, spatial patterning, and edge modification.

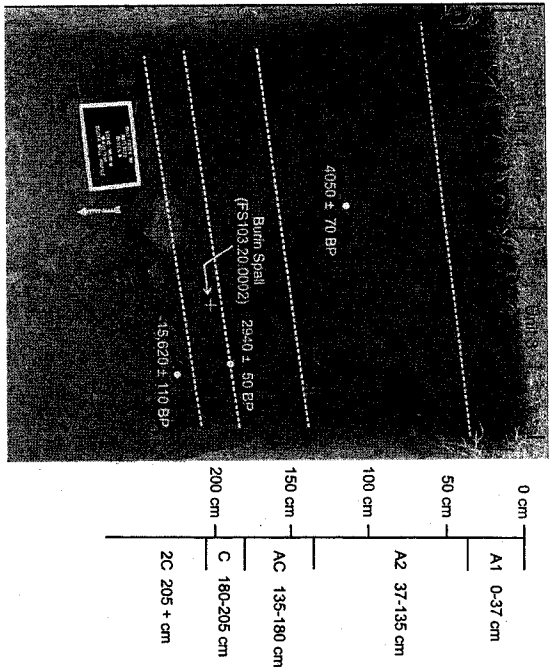


Figure 5-3. South wall profile of Block B, Units 3 and 4 on southeast side of Obsidian Hill Creek fan. □ indicates 14C sample (location of point symbol represents elevation of sample).

Archaeologists have long demonstrated the utility of debris analysis for understanding not only the technology of lithic reduction but also an interest in how lithic technology relates to the function of individual assemblages within larger systems (Andresky 1994; Bamforth 1986; Binford and Binford 1966; Dunnell 1966; Goodyear 1993; Kelly 1988). In order to make statements about site function or its role in a larger network of sites, it is necessary to make logical connections between specific behaviors and expected material correlates.

In this project we test interpretations made about activities performed at sites along the Wilson-Fall Creek Road in Jackson Hole, Wyoming, using data derived from the excavated lithic assemblages (Cannon et al. 2001). As discussed above, "site types" are identified using a traditional cultural resource management (CRM) framework, built in part on Bender and Wright's work. These identifications utilize observations made in the field, based on site setting, amount of area occupied by cultural materials, and site characteristics, such as the presence of features. Testing these identifications must rely on data independent of those used to create them; in this case lithic characteristics provide such data. In the following section we supply the logical connections between behaviors (identified with type of site use, or occupation) and their material correlates (i.e., archaeological data).

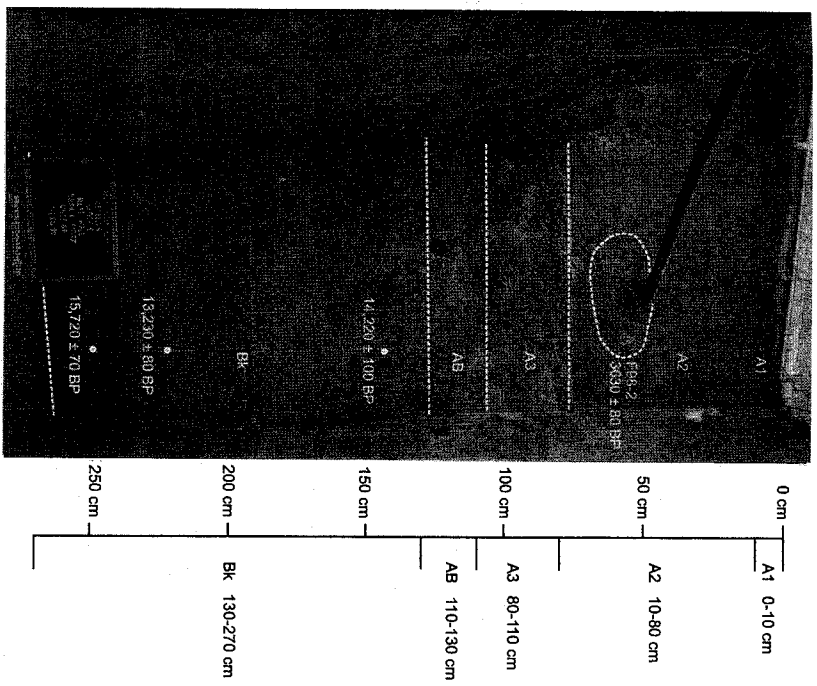


Figure 5-4. West wall profile of Block E, Unit 55 from northwest portion of site. □ indicates 14C sample (location of point symbol represents elevation of sample).

*Lithic Data-Collection Procedures*

Chipped-stone artifacts were analyzed through a nested approach. A small sample of the overall assemblage was subjected to detailed data collection on individual artifacts. The list of dimensions recorded included an array of variables related to size, reduction technology, edge modification, and completeness (Cannon et al. 2001: Appendix J). The size of the overall assem-

blage, however, prohibited collection of those data for all artifacts recovered in the WFCR project. Therefore, mass data-analysis procedures were followed for the remainder of the chipped-stone artifacts. Data collected in such a manner included (among others) the variables of size grade, presence of cortex, and presence of edge modification. The analyses presented here are thus based on data collected from the entire WFCR assemblage.

*Site Types and Expectations*

*Base Camp*

Interpretations based on the definition of base camp given above may be tested with lithic data. Base camps are defined as places occupied by the whole or main portion of the domestic group, or cohabitating community, for some extended period of time. This definition translates into a series of expectations about the whole assemblage (Table 5-2). We expect the highest variety of activities to be represented due to the relatively large numbers of people and amounts of time spent at these locations. So sites defined as base camps are expected to have high degrees of diversity in stone-tool types. Diversity is best addressed here as a bivariate measure, including richness and evenness (Dunnell 1989; Jones et al. 1989). Both richness (number of classes represented) and evenness (distribution of cases among classes) are expected to be highest for these assemblages (Shott 1989). Such diversity of cases is also expected to be reflected in activity patterning. Base camps should have more marked spatial patterning than either secondary base camps or special-use sites, although palimpsest issues may come into play for repeated or especially long-term occupations, complicating the detection of spatial patterning. Finally, due to occupation span and intensity, as well as span of activities performed, lithic debris in assemblages identified as base camps should contain the full range of the reduction sequence, with a substantial amount of middle- to late-range reduction debris, in comparison to other sites.

*Secondary Base Camp*

Intermediate-use sites are difficult to define as, by definition, they lie behaviorally between the domestically oriented, long-term, full-community assemblages resulting from base camps and the transitory small-group SUS assemblages. All material correlates expected from SBCs are thus defined in relation to that continuum and in comparison to other assemblages.

Diversity of tools at a SBC is expected to be intermediate between that of a base camp and a SUS. A range of (day-to-day, as well as resource-extraction) activities are interpreted to have been performed, so the range of tool classes (i.e., richness) may be equivalent to that for base camps. However, due to the more ephemeral nature of occupation, evenness is not expected to match that for base camps. Spatial patterning should be intermediate as well, depending again on reoccupation issues. Given that chipped stone dominates Fall Creek Road assemblages, SBCs are interpreted as being organized around toolstone procurement. The kind of lithic reduction represented at these sites should be associated with bifacial and amorphous core-reduction debris, as inhabitants

**Table 5-2. Expectations for Variables Relevant to Length of Time, Number of Occupants, and Nature of Occupancy of Lithic-Dominated Sites**

	<i>Base Camp</i>	<i>Secondary Base Camp</i>	<i>Special-Use Site (immobile resource)</i>
Diversity	High	High	Low
Richness	High	Low	Low
Evenness	High	Low	Low
Spatial patterning	High	High-medium	Low
Range of reduction	Skewed toward late	Mid-range	Skewed toward early

reduced toolstone for both immediate and future needs. Finally, all portions of reduction are expected at SBCs focused on toolstone, but assemblages should be weighted toward early and middle portions of the sequence.

*Special-Use Sites*

This third site type derived from the HCA represents the low-intensity and short-span-of-use portion of the occupation spectrum. Because only a contingent of a given group used the sites, and only for limited periods of time for limited purposes, SUS assemblages are expected to have low lithic-tool diversity, both in terms of richness and evenness. The singularity of purpose defining SUSs also requires limited spatial patterning at such sites. In the case of the WFCR assemblages, in which interpretations indicate lithic quarrying activities as the specific kind of "special use," early- to middle-range bifacial-reduction debris should dominate the toolstone components.

*Alternate Variables: Testing Site-Type Identifications from WFCR*

Three lithic assemblages were excavated as part of the WFCR project (Figure 5-2). Those assemblages may be used to begin testing interpretations integral to the HCA. This section presents our expectations of the lithic assemblage for each of the Wilson-Fall Creek Road sites on the basis of field observations and the criteria derived from the HCA model (Table 5-3).

48TE1077

Based upon its location and setting as well as its lack of features or obvious variability, the working model for the Fish Creek Ranch assemblage is that it represents the remains of a SUS. Therefore, its chipped-stone assemblage should contain higher proportions of early-phase reduction debris (and conversely, little evidence of retooling). There should be low levels of diversity; numbers of tool classes should be low; and the distribution of cases across

**Table 5-3. Testing Site Function: Expectations for and Results of Artifact and Assemblage-Level Lithic Tests**

Expectations	48TE1077	48TE1079 SE	48TE1079 NW	48TE1374
	Special-Use Site	Base Camp	Special-Use Site	Base Camp
Reduction range	Early	Late	Early	Late
Ratio of edge wear	Low	High	Low	High
Spatial distribution	Homogeneous	Heterogeneous	Homogeneous	Heterogeneous
Assemblage diversity	Low	High	Low	High
<b>Results</b>				
Reduction range	Early: more large pieces, more with cortex	Late: fewer large pieces, fewer with cortex	Early: more large pieces, more with cortex	Somewhat late: same size, fewer pieces with cortex
Ratio of edge wear	Slightly low	High	Same as overall	Low
Spatial distribution	Homogeneous	Heterogeneous	Homogeneous	Homogeneous
Assemblage diversity	Low richness, high evenness	High richness, neutral evenness	Mid-low richness, low evenness	High/low richness, high/low evenness

those classes present should be uneven, corresponding to the limited number and focus of activities expected at that locale. Finally, we expect very limited spatial patterning of materials.

#### 48TE1079—Southeast Section

Based on the behavioral interpretation of base camp outlined above, we expect the later range of lithic reduction, a higher ratio of edge modification and wear, more heterogeneous spatial patterning of materials, and higher assemblage diversity to be represented in the southeast 48TE1079 assemblage than in other WFCR project assemblages.

#### 48TE1079—Northwest Section

The northwest section of 48TE1079 matched field-based descriptions of a SUS or lithic-acquisition locale. Expectations of this assemblage parallel those outlined for 48TE1077: earlier-range reduction, lower ratio of edge modification, more homogeneous spatial distribution, and lower assemblage diversity than overall WFCR values.

#### 48TE1374

On the basis of the features of this site discussed above, 48TE1374 is initially interpreted as a base camp or secondary base camp. We expect a relatively late range of reduction, low ratio of edge wear, heterogeneous distribution of large flakes and those with cortex across excavation blocks, and high assemblage diversity for this assemblage in relation to others in the WFCR project.

## Results

### 48TE1077, the Fish Creek Ranch Site

Expectations outlined for the assemblage from 48TE1077 are, on the whole, met. Initially interpreted as a SUS, Fish Creek Ranch materials were expected to represent early lithic reduction, a low incidence of flake use for tools, and relatively few activities, all in relation to other WFCR assemblages. When we compare all WFCR block contents in terms of proportions of cortex and large (> 1.27 cm) debitage, we see that the blocks of 48TE1077 are relatively homogeneous. All blocks from this site have a higher proportion of cortical debitage ( $G$  [chi-square likelihood ratio, SPSS version 8.0] = 2836.588,  $df = 21$ ,  $p = .000$ ) and an average to high proportion of large pieces ( $G = 531.624$ ,  $df = 21$ ,  $p = .000$ ). Such intersite analyses allow us to evaluate not only the level of spatial patterning of these lithic variables but also the direction of that patterning. Analyses indicate that 48TE1077 is relatively homogeneous across space and contains relatively early-range reduction debris. Both conform to expectations for a focus on lithic acquisition.

The remaining tests also lend general support to the interpretation of SUS for the Fish Creek Ranch assemblage but not as resoundingly as the first two discussed. At 047, the number of tool edges per usable (> 1.27 cm) flake is very close, albeit below that for the WFCR materials overall (.059); we would expect this ratio to be much lower relative to the others if Fish Creek Ranch really represents only lithic-acquisition activity.

Additionally, diversity measures derived for the assemblage offer only qualified support for the behavioral interpretation. Table 5-4 lists the richness and evenness values calculated for the Fish Creek assemblage, along with those derived for other WFCR assemblages. The 48TE1077 assemblage has the lowest values for functional and lithic-artifact richness yet the highest evenness values of all assemblages. So, while relatively few classes are represented (as predicted initially), the distribution of cases across classes is even. These



Table 5-4. Results of Diversity Measures Applied to WFCR Assemblages

Diversity Measures by Class	48TE1077	48TE1079 East	48TE1079 West	48TE1374
Functional classes <sup>a</sup>				
Richness	-0.435 (low)	0.005 (mid)	0.295 (high)	0.135 (mid-high)
Evenness	-7.6 (high)	-32.9 (low)	-22.6 (mid-low)	-8.34 (high)
Lithic classes <sup>b</sup>				
Richness	-0.179 (mid)	-0.247 (low)	0.739 (high)	-0.314 (low)
Evenness	-9175 (high)	-43006 (low)	-21543 (mid-high)	-11445 (mid-low)

Note: Richness values are unstandardized residuals derived from the regression of class rank by number of pieces; negative values indicate fewer classes than expected in an assemblage. Evenness values were derived from the slope of the regression line, which is fit to the same variable; a steeper slope indicates lower evenness.

<sup>a</sup>Functional diversity is based on the number of tool- or use-wear classes represented in the assemblage:  $r^2 = 0.61$ ; adjusted  $r^2 = 0.41$ .

<sup>b</sup>Lithic diversity is based on the number of all lithic classes represented in the assemblage:  $r^2 = 0.89$ .

evenness values complicate the interpretation of 48TE1077 somewhat. Here the potential interpretive resolution of the bivariate measure of diversity is apparent; while richness indicates relatively few activities, the focus does not appear to have been particularly uneven across the activities that are represented.

#### 48TE1079, the Crescent H Ranch Site

##### Southeast Section

From our initial behavioral interpretation of base camp for the southeast portion of 48TE1079, we expect a later range of reduction (reflected in smaller pieces and less cortex), a higher ratio of edge modification and wear, more heterogeneous spatial patterning of materials, and higher assemblage diversity than those found in other WFCR project assemblages. Many of these expectations are borne out by our tests. There are fewer large flakes ( $G = 154,651$ ,  $p = .000$ ) and flakes with cortex ( $G = 2166,211$ ,  $p = .000$ ) than in other assemblages, supporting expectations about range of reduction. There is also a relatively high ratio of modified edges to large flakes in this assemblage (.074 vs. .059 for WFCR overall), supporting interpretations of reduction for purposes of flake-tool production. In addition, distribution of large pieces and those with cortex across the excavated area is also heterogeneous, supporting expectations about spatial patterning. Diversity measures (Table 5-4) also offer support for the residential interpretation, giving high values for richness and neutral evenness values (mid-low for functional evenness, and mid-high for overall evenness).

##### Northwest Section

Expectations for the content of the northwest 48TE1079 lithic assemblage parallel those outlined for 48TE1077: earlier-range reduction, lower ratio of edge modification, more homogeneous spatial distribution, and lower assemblage diversity than overall WFCR values. Again, tests generally bear out our expectations. There are more large flakes and flakes with cortex in this assemblage than in other WFCR assemblages. The ratio of edge wear to large flake (.061) is similar to that derived for the overall assemblage (.059) lending no support for the interpretation, but distribution of large flakes and those with cortex across excavation blocks is relatively homogeneous, as expected for a SUS. Diversity values derived also generally support this interpretation; functional evenness, overall lithic richness and overall lithic evenness all line up with expected relative values, while functional richness is neutral (Table 5-4).

#### 48TE1374, the Burchardt Site

From field-based site interpretation of 48TE1374 as a base camp, we expect a relatively late range of reduction, high proportion of pieces with edge wear, marked spatial patterning, and high assemblage diversity in relation to others in the WFCR project.

Expectations about range of reduction are not contradicted but not strongly supported either. In overall WFCR assemblage comparisons, the Burchardt site has very few pieces with dorsal cortex ( $G = 2166,211$ ,  $p = .000$ ), but the proportion of large debris is closer to the average ( $G = 154,651$ ,  $p = .000$ ).

Neither are expectations for ratio of tool use met. This assemblage has only .015 tool edges for each usable flake, far below all other WFCR assemblage values (overall WFCR is .059 edges per usable flake). This finding reflects low frequency of tool use in proportion to reduction activities and thus does not support interpretation of a focus on residential site use.

In addition, comparisons of all WFCR block contents do not support expectations of heterogeneous spatial patterning. All blocks from this site contain little cortex relative to all WFCR blocks ( $G = 2836,588$ ,  $p = .000$ ), and all are close to average values for large (> 1.27cm) pieces ( $G = 531,624$ ,  $p = .000$ ). Thus, the 48TE1374 assemblage does not conform to expectations regarding spatial patterning for residential sites.

Measures of functional diversity conform to expectations based on initial interpretation of 48TE1374 (Table 5-4). The number of functional classes represented in the chipped-stone tool assemblage is relatively high in light of total number of tool edges, and the distribution of cases is fairly even in relation to other WFCR assemblages. Overall lithic-artifact diversity measures (including all lithic-artifact classes), however, oppose these results. The observed number of classes is below that predicted by a regression line formed from all assemblage class counts by total artifact numbers (Table 5-4), and the slope of the regression line formed for class rank by number of cases within each class is relatively steep. From these analyses, it appears that a relatively homogeneous collection of activities took place at 48TE1374; high functional-diversity values

(calculated using only tool classes) are offset by the small contribution of artifacts in these classes to the overall assemblage (eight tools, with 18 total analyzed edges). Since the unmodified lithic assemblage far outweighs the tool assemblage, it appears that lithic reduction was the primary site activity.

This combination of results does not support our interpretation of 48TE1374 as a base camp. Although a fired-rock feature was found there, lack of spatial patterning in debris characteristics, low assemblage diversity, inconclusive results in terms of portion of reduction, and an extremely low ratio for tool edges support an interpretation for 48TE1374 that is closer to the lithic-acquisition site type than to the base-camp site type.

### Discussion

Our initial interpretations and subsequent analyses demonstrate the potential and limitations of the overriding approach to the archaeological record of hunter-gatherer activities in the intermountain region surrounding Jackson Hole. For example, expectations for lithic assemblages based upon field interpretations were met to some degree. Both 48TE1077 and the northwest portion of 48TE1079 fit expectations for an assemblage generated via lithic-acquisition activities. However, we have also found some cases in which intuitive or simplistic interpretive conclusions are not matched by more detailed assessments. The assemblage from 48TE1374 appears by some standards to fit the definition of a base camp. Its accessible location, apparent diversity of activities, and presence of features all support its use as a longer-term, domestic-use site likely occupied by a large proportion of the community. Its smaller spatial extent, however, complicates this interpretation somewhat. Following the examples set by Bender and Wright (relying on size to determine use) would lead to an interpretation of SBC for 48TE1374, but given other information, we initially interpreted it as a small base camp. Detailed lithic analyses support an interpretation of SUS for lithic acquisition instead of SBC. The southeast portion of 48TE1079 also contradicted expectations generated from the HCA model and was also initially interpreted as a base camp; however, detailed lithic analyses support an interpretation of SUS. This application points out several of the problems (as observed earlier) inherent in the HCA approach to the record of intermountain regions.

### Unidimensional View

The unidimensional approach is overly simplistic in its view of the archaeological record and has serious drawbacks. Bender and Wright (1988) discuss the relevance of several variables such as site size, number of tools, and assemblage diversity to the definition of site type. However, they use only one dimension—size—to place individual sites into type groups. Although they demonstrate the tendency of particular variable states (large spatial extent, high assemblage diversity, location within an accessible ecotone area, etc.) to co-occur, this is just a generalization. The occurrence of a site such as 48TE1374 demonstrates that multidimensional variability needs to be considered in descriptions and analyses of the archaeological record.

### Plant-Based Settlement

The HCA is also too simplistic in its focus on plant-driven settlement. Defining site types based specifically on plant resources is too limiting and precludes consideration of other resources to be central to settlement and land use. For example, a SUS in a lithic-driven context may be different in spatial extent and artifact density than it would be in a context driven by plant exploitation. Lithic-acquisition locales are likely to be very permanent, as suitable toolstone locations are not expected to change through time and may in fact appear to contain a higher intensity of occupation than would be expected for areas of plant-resource extraction. This is particularly true since plant communities may shift through time as a result of climate change, succession, or overutilization. Amounts of permanent debris are very different for the two kinds of activities, with the lithic-based SUS retaining a much more visible signature on the landscape. Using the HCA model, which is formulated to interpret settlement systems based on expectations for plant-driven settlement, may be obscuring our understanding of a record formed largely around lithic (or other) resources.

While the HCA authors argue that plant resources are only seasonally available and thus must be the driving force in settlement patterns, their model does not allow for that seasonality factor in other kinds of resources, especially those in intermountain regions. Many lithic resources represented in assemblages found outside of Jackson Hole (and the Greater Yellowstone Ecosystem) contain materials originally from elevations that were practical for human use only during limited parts of the year (e.g., Smith 1999). Thus, lithic materials are also a seasonally available resource and may well have been drivers for settlement. These considerations alone render the HCA, as previously applied, an inadequate means of dealing with the archaeological record.

### Evaluating Conclusions

The HCA approach to the record is also inadequate in that interpretive units are the same ones used to describe the record. For example, base camps are both interpreted and defined by their characteristic settings and size. There is no room then for evaluating the base camp interpretation, or the settlement scheme within which site is placed. The Wilson-Fall Creek Road project attempted to break that tautology. By extracting definitions from Wright's and others' site type descriptions, we were able to test interpretations, and ultimately the applicability of the HCA. Such an approach may help archaeologists build regional subsistence-settlement models that are testable and thus add to our cumulative knowledge about past hunter-gatherers.

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## 6. Environment and Resource Distribution in the British Early Mesolithic: Toward More Defined Settlement Modeling

Michael J. Reynier

**Abstract:** This essay takes as its starting point a review of the so-called deer hunter model, the traditional economic model of Early Mesolithic settlement in the United Kingdom first put forward by Graham Clark in the 1970s, comparing it against recent evidence that suggests that model may not be the most useful interpretation of these data in light of more recent research. Developments in typological, chronological, and settlement modeling are central to this problem, and these models are briefly set out. The models suggest that Early Mesolithic human settlement patterns are indeed closely geared to the changing Early Flandrian environment but that that environment is somewhat more complex than early models posited. Rapid environmental changes are observed, and it is suggested that they are likely to have altered the type and distribution of edible resources to such an extent that human economic strategies were forced into several adaptations over the period rather than just one. Several possibilities are discussed, and three traditional settlement models that may better accommodate the present archaeological data are put forward. It is concluded that ultimately even more refined models need to be developed for the period and location.

For over twenty years, models of Early Mesolithic settlement in Britain have hinged on one basic tenet: that human groups were dependent on red deer and that as a direct result, economic strategies, and consequently human settlement patterns, were tied closely to the movements and behavior of that key resource. This argument was first put forward by Graham Clark in his reevaluation of the excavations at Star Carr in Yorkshire (1972), and since then, the model (often referred to as the "deer hunter" model) has been used

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