[Slide 1] Variability in Large Game Trapping Strategies in the Great Basin, USA:

Communal Fandangos, Prestige Hunting, or Optimal Foraging?

Bryan Hockett, Cliff Creger, Beth Smith, Craig Young, and James Carter

Paper presented at the 77th Annual meeting of the Society for American Archaeology

April 18-22, 2012 Memphis, Tennessee

Prehistoric large-scale trapping features **[SLIDE 2]** designed to capture artiodactyls in the Great Basin have been reported for more than 50 years. No systematic overview of their distribution, abundance, age, and design features, however, has been published. This presentation is a brief overview of large-scale big game traps in Nevada **[SLIDE 3]**, with some of our initial thoughts on why they may have been constructed in the first place. Big game **[SLIDE 4]** most likely trapped in Nevada's prehistoric past include pronghorn antelope, mountain sheep, and mule deer. We define large-scale trapping features **[SLIDE 5]** as those that required more than an individual or a single family group to build. Thus, single hunting blinds or multiple hunting blinds that were each constructed by a family unit are not considered here. Large-scale trapping features **[SLIDE 6]**, then, required communal effort to construct them. **[SLIDE 7]** Our use of the term "communal" means multiple family members or groups working together for a common purpose or goal. Communal groups that constructed large-scale trapping features in the Great Basin could have included all members of multiple families, or they could have consisted of 'men-only' groups pooled from multiple families.

In Nevada, there were two possible types **[SLIDE 8]** of large-scale traps constructed prehistorically: (1) drive lines or drift fences; and (2) **[SLIDE 9]** corrals with associated wings. "Possible" is used because no mathematical modeling data are available for the Great Basin on whether rock-walled drive lines **[SLIDE 10]** were constructed communally as has been documented ethnographically for juniper corrals. We rectify this situation by reporting the results of an experimental archaeology research project designed to model the time requirements and effort necessary in calorie expenditure to build the Fort Sage Drift Fence **[SLIDE 11]**. In addition to this experimental research, our published paper will provide information on complementary data sets that lead to a more complete understanding of these features, including **[SLIDE 12]** analysis of breakage patterns of projectile point concentrations found close to **[SLIDE 13]**, and in many cases on top of existing drive lines and corrals; and **[SLIDE 14]** depictions of large-scale hunting features in rock art.

This map **[SLIDE 15]** shows every large-scale trapping feature in the state of Nevada that we have been able to discern to date from published and unpublished sources. At least 95 large-scale trapping features have been recorded across the state. The vast majority of them are located in northeastern Nevada and in western Nevada south and east of Walker Lake. Almost all of the remaining structures are located in a crescent-shaped block spanning the central portion of the state.

Because many of the projectile point concentrations **[SLIDE 16]** associated with juniper corrals and drive lines in Nevada consist of early Late Archaic and earlier Middle Archaic types dating between 6,000 – 650 years ago, these point concentration sites have been interpreted previously as evidence for large-scale communal hunting of ungulates for thousands of years. Of the 41 localities that contain between 1 and 13 structures, 14 (or 34%) contain evidence for the trapping or driving of large game at that same locale sometime between 6,000 and 650 years ago.

On-going studies **[SLIDE 17]** of projectile point damage patterns at traps, dehafting sites, and campsites are revealing interesting patterns. Our data suggest that midsections tend to be relatively common at all three site types. Predictably, bases dominate at dehafting sites. Trap or kill sites tend to consist of greater percentages of complete points and point tips compared to dehafting sites. Campsites tend to consist of higher percentages of both complete points and point tips compared to trap and dehafting sites.

[SLIDE 18] Switching gears to the original question I mentioned a minute ago, Were rock-walled drive lines and juniper corrals "large-scale trapping features" in Nevada? In order to answer this question our research methodology involved building an experimental section of Fort Sage Drift Fence **[SLIDE 19]**. The experiment was designed to address six specific questions: 1) **[SLIDE 20]** How many days would it have taken to build the FSDF by an individual in a single event?; 2) **[SLIDE 21]** How many people would it have taken to build the FSDF in a communal effort in a single event, or over the course of several events?; 3) **[SLIDE 22]** How many calories were required to build the FSDF?; 4) **[SLIDE 23]** How many pronghorn antelope would need to be consumed to equal the number of calories required to build the FSDF?; 5) **[SLIDE 24]** Based on our model, was the FSDF likely constructed in a single event or in sections over some length of time? Was it likely constructed by an individual or by communal groups?; and relatedly, 6) **[SLIDE 25]** What were the costs of constructing juniper-sagebrush corrals?

In order to address these questions, 11 volunteers **[SLIDE 26]** spent two hours building an experimental FSDF. We chose a location only one mile from the FSDF itself in order to maintain authenticity. Our experimental fence was built to the specifications of a typical section of the rock wall itself, namely: (1) it was built to measure approximately 1m in height and 1m in width.

[SLIDE 27] The experimental fence was constructed by 11 people who ranged in age between 20 and 66 years. There were seven men and four women who participated. Working nearly continuously for two hours, we constructed a rock fence measuring 14.5m in length, or an average of 7.25m of fence per hour. **[SLIDE 28]** This translates to an average of .66m of fence per person per hour. **[SLIDE 29]** Given that there was 1,025m of rock wall constructed prehistorically, **[SLIDE 30]** it would have taken one person 1,553 hours to construct the FSDF.

We think it unlikely that more than two hours per day were expended prehistorically to build the FSDF because these two hours required an extra 900 calories of work effort per person. **[SLIDE 31]** If two hours per day were committed prehistorically, then it would have taken an individual 777 days, or two years and two months to construct the entire FSDF. **[SLIDE 32]** If four hours a day could have been expended building the fence, it would have taken a single person 388 days, or about one year and one month to construct the fence.

[SLIDE 33] Communal events documented ethnohistorically in the Great Basin often involved 20 or more people, and some accounts state that 50 people were required to construct a juniper-and-sagebrush antelope corral and associated wings. These communal gatherings often lasted for two weeks or longer. If we assume, first, a modest number of 40 individuals congregated in a communal event with 20 of those individuals involved in constructing the fence for 10 of the 14 days, then this group could have constructed the entire FSDF in about 40 days working two hours per day. At this level of work **[SLIDE 34]**, the FSDF could have been constructed in four 14-day sessions. In each session, a total of 256m of wall would have been constructed.

[SLIDE 35] We estimate that the average person would expend about 450 kcals per hour (or 900 kcals every two hours) building the rock wall, given current estimates of similar work effort. Given our estimate of 1,553 person hours to construct the rock fence, then, approximately 700,000 extra kcals were required to construct the entire FSDF. **[SLIDE 36]** To construct 250m of fence, an individual would need to expend a total of 647,500 kcals. Our communal group of 40 would expend 1.575 million kcals.

Based on a review of the literature, we use 22,500 edible kcals per pronghorn for our modeling exercise. Based on this estimate, about 70 pronghorn would need to be captured along the FSDF and consumed by 40 people during a 14 day communal event. That equates to about 2,900 kcals per day. McCabe et al. (2004) state that a 3,400 kcal per day consumption is a good estimate at communal events, so these figures are well within that target range.

In contrast, an individual would need to take 29 pronghorn. This equates to about 3,450 kcals per day. While this is a reasonable kcal consumption, an individual would need to continuously stay at the FSDF for more than six months, killing and eating an entire pronghorn every six days to construct one-quarter of the fence.

[SLIDE 37] Communally, it would require 6.3 million kcals and 56 days to construct the entire FSDF in one session. This would equate to 280 pronghorn. And while capturing nearly 300 pronghorn may have been possible at times, 40 people staying in the fence area for 56 days is highly unlikely. Individually, it would require about 2.6 million kcals and 777 days (or more than two years) to construct the FSDF. This would equate to about 116 pronghorn.

[SLIDE 38] The problem faced by both the individual and the group is not the number of kcals per se, but the feasibility of camping along the FSDF for an appropriate amount of time given the availability of the resource. Pronghorn likely would have been available for capture during a relatively short period of time as they migrated through the region to spring/summer and fall/winter pastures. A communal group of 40 individuals building 250m of fence, camping there for 14 days while capturing and consuming 70 pronghorn seems reasonable. An individual camping at the FSDF for six months to two years is simply beyond reason. Therefore, we conclude that the FSDF was constructed by communal groups, in sections, over some length of time.

[SLIDE 39] In a review of the ethnographic literature on communal antelope drives, Jensen suggested that the average juniper corral took 64 people to construct, with an average of 133 individuals in attendance. Based on our estimates, 64 people could construct a corral in 25 hours, so this group could construct a corral in the same 10-day period as a 250m section of rock wall if they also worked two hours per day as was modeled for the FSDF. If we also assume that corral building required about 25% less kcals per hour than building a rock fence, then more than five million kcals would be needed to sustain a group of 133 individuals over a 14-day period. This equates to 227 pronghorn captured and consumed to equal kcal expenditure.

Several ethnographic accounts suggest that corral building was accomplished by less than 100 people, and one publication simply stated that at least 50 people were required. If we model 50 individuals attending a 14-day communal gathering, with 35 people engaged in corral construction, then 89 pronghorn would need to be captured and consumed to equal the kcal expenditure. This may be more reasonable than the 133 individuals estimate also modeled here.

[SLIDE 40] In the final analysis, whether the construction of the FSDF or juniper-sagebrush corrals were built individually or communally comes down to feasibility and functionality rather than kcal savings or surplus. It is simply not possible for an individual to construct such features in the time necessary to have a successful hunt and procure the necessary animals to sustain life. Working communally, however, increases the efficiency of the process by building functioning large-scale traps that are capable of capturing the necessary kcals.

[SLIDE 41] If 50-200 pronghorn represents the typical number of animals captured during a 14-day communal gathering, then our modeling exercise suggests that the average group size that would render a functioning event would probably range between about 40-75 people, with an average of perhaps 60-75 individuals in attendance. That would represent about 7-10 families consisting of an average of 6-8 people per family group. If these were 'men-only' affairs, then more than 7-10 families would be necessary to pool enough males to build these structures and perform a successful capture.

[SLIDE 42] In this exercise there is no compelling evidence that these large-scale structures would be built as optimal energy capturing devices, a conclusion also reached by McCabe et al. (2004) and Jensen (2007). Given that over the 14 day period a group of 40 would need to consume at least 70 pronghorn, and a group of 50 individuals would need to capture about 90 pronghorn just to sustain basic daily kcal needs, it is difficult to interpret that the primary purpose for the construction of these structures was for individuals to optimally extract energy from the environment. Consuming other food items would be absolutely necessary from a nutritional point of view, and would also serve to provide a buffer against low numbers of fence or corral kills during these communal events.

[SLIDE 43] Once built, however, the maintenance of the FSDF or a juniper-sagebrush corral would not require as many kcals compared to the initial investment in kcals it took to construct them from scratch (shown on the final column of this table). Nevertheless, the FSDF would still require over 60 pronghorn to be captured by 40 people over a 14-day period; similarly, almost 80 pronghorn would need to be captured and consumed by a communal group of 50 people reusing a corral. These data suggest that less than 80 animals might result in a net loss of kcals.

[SLIDE 44] Structures such as the FSDF and juniper-sagebrush corrals were built communally to take advantage of predictable resources in greater abundance during specific times of the year, and probably to tie these natural events to social gatherings which were used to strengthen alliances, exchange information, and match-make for marriages. This type of communal event has been described in the ethnographic literature of the Great Basin, and did not require a complex political hierarchy or any type of prestige hunting behavior. In fact, most of these communal events were led by an "antelope shaman", similar to a "rabbit boss" who led communally-based jackrabbit drives in the Great Basin.

[SLIDE 45] A "Cultural Ecology Model" seems to be as good of an explanation for the construction of large-scale trapping features in the Great Basin as any other approach, despite the fact that standard cultural ecology models have fallen out of favor, having been replaced by reductionist energy or sociopolitical models over the past 40 years of Great Basin research.