SPECIAL ISSUE: MOUNTAIN AND HIGH-ALTITUDE ARCHAEOLOGY

the
SAA
Archaeological record
March 2014 • Volume 14 • Number 2

SOCIETY FOR AMERICAN ARCHAEOLOGY
The title of this article alludes to a fundamental question driving a substantial amount of alpine archaeological research: are high-altitude environments so limiting in terms of biotic productivity, oxygen availability, pronounced seasonality, extreme cold, and unpredictability as to necessitate some sort of external mechanism (e.g., climate change, increased lowland population densities, the development of sociocultural complexity) to initiate their intensive exploitation and habitation (Aldenderfer 2006)? Or are they so seasonally productive and do they offer such novel opportunities not available in the lowlands that they entail their own incentives for intensive occupation (Walsh et al. 2006)? To be clear, people across the globe often used (and use) alpine settings sporadically, non-intensively, and opportunistically as hunting grounds for alpine fauna like sheep and goats and to travel and trade between locales separated by mountain ranges (Canaday 1997). The question is, why do they sometimes build permanent structures and start living in larger groups for longer periods of time (leaving behind substantial middens) in above-treeline environments? Answering this question drives a large part of my current research in the mountains of North and South America and is informed by nearly two decades of doing archaeological work in mountain settings. Rather than address this question with proxy data for population size, environmental productivity, and alpine settlement and subsistence patterns, here I take the opportunity to address these issues more intuitively by reflecting on the benefits and costs of working in high-altitude environments.

My first encounter with serious high-altitude archaeological research began in 1996, when I began working with Dr. Tom Jackson on a three-year-long CRM project driven by the relicensing of Southern California Edison’s (SCE) aging hydroelectric facilities in the High Sierra. The project was a data recovery operation for a series of sites, some with buried paleosols capped by tephra, on the east side of the Sierra Nevada, just outside the alpine regions of Yosemite National Park. Its research agenda focused on figuring out the effects of Late Holocene volcanism, marked by those tephras (from nearby Mono and Inyo craters), on the region’s prehistoric populations.

Beyond the archaeology, the thing that struck me about the project was its logistics. We had to work in the fall before the first snows but after the reservoir being relicensed had been drawn down (some of our best sites were below the maximum pool elevation of the reservoir)—maybe a one-month window of time. I had worked on plenty of camping-based projects before, from the Mogollon Rim to the top of the southern Sierra Nevada, but always out of vehicles. Here we had to get a full crew of people, excavation gear, and camping equipment up into the mountains for a two-week stay. The screens had to be broken down to fit on pack mules. The food had to be packed in and strung up in bear bags. That first year, we rode an open-compartment incline railway (a remnant of SCE’s early-twentieth-century infrastructure and really just a small nine-person cart hauled up a set of tracks by winch-driven cable) up about a 45-degree slope, crossed a high-altitude reservoir by boat, and then proceeded by trail a few miles to our campsite. Our food was brought in by a string of mules. The following two seasons, we ditched the inline railway and boats (it was alleged that an equipment malfunction killed an SCE employee on it after our first trip), riding 10 miles on mules with the rest of our gear and food.

That first season, the weather was gorgeous, as only the early fall in the High Sierra can be. John Muir (1912) was spot-on in calling these mountains the “Range of Light.” The archaeology was top-notch—we had sites with midden, bedrock mortars, and intact stratigraphy (quite rare in mainland California) at nearly 3,000 m in elevation. The second season was a different story. After we packed in, set up camp, strung hundreds of pounds of food up in the trees with a Gerry-rigged pulley system (to keep it away from Yosemite’s notorious black bears), and renewed the excavations started the
year before, a blizzard blew in, dumping snow and coating the granite cliffs with ice. The Range of Light quickly became something more like Mt. McKinley’s Alaska Range. Some of us had four-season tents, down jackets, Gore-Tex shells, and mountaineering-style boots. Some didn’t and compensated with duct-tape, ending up looking like they were ready to join John Glenn on Friendship 7. We tried to work through the storm, but it quickly became apparent that some folks weren’t well enough equipped to deal with the worsening storm. It got so cold, snowy, and windy one morning that we made the call to bug out and head back down the mountain. Without mules or full-sized backpacks, we left tents, food, and most of our gear behind, carrying what we could in our field packs. Tom and I rode up on mules the following week to inspect the damage and assess the possibility of trying again. The gear was intact and the forecast good, so we headed back up on mules the following week, many of the crew with expensive, brand-new Gore-Tex jackets and boots. Of course the snow melted, the weather was balmy (those expensive jackets stayed in their duffel bags), and the second field season was ultimately a success, as was the third.

What did we learn? In terms of archaeology, something very interesting: that hunter-gatherers in the region adapted to the region’s volcanism with mobility. When one Sierran pass was burned off and blanketed in volcanic ash, another nearby was used more intensively (Jackson and Morgan 1999). The region’s volcanic activity represented less a catastrophe than an inconvenience. But working in the High Sierra was costly, unpredictable, time-constrained, and required a lot more planning than the projects I had worked on in the lowlands. In addition to the normal costs of fuel, food, vehicles, and payroll, were the mules (not cheap!), SCE’s outlays for logistical support (I thankfully never saw that end of the budget), the necessity of quality outdoor gear (REI being the main beneficiary here), and, especially in that second season, nearly doubling the logistical budget due to the weather.

The next six or so years saw me spending an inordinate amount of time in the central Sierra working on a slew of hydroelectric relicensing projects for SCE and conducting surveys for the Forest Service. We operated under much the same constraints as before. We often had to get in either right before spring thaw (prior to the reservoirs filling up) or late in the fall (after they’d emptied). In the spring, we took advantage of SCE’s largesse and flew crew, gear, and a zodiac boat over the 3,000-m Kaiser Pass in a helicopter (Figure 1), excavated the sites on our itinerary, and worked through a late-season snowstorm. One crew member suffered pulmonary problems, to the point of being tent-bound the entire trip, but we couldn’t evacuate her over the pass due to the storm (she recovered after the trip). In the fall, working again out of vehicles, we typically found ourselves trying to get one last site dug before the onset of winter. Inevitably, this meant breaking camp as the first storm of the season hit, cramming gear and crew into field vehicles and driving the icy one-lane road over Kaiser Pass in a blizzard. In the summer, we would survey the alpine zone. To move fast, we worked without pack animal support, carrying meticulously prepared camping and recording gear and 10 days of food on our backs. If the gear or food wasn’t absolutely necessary or couldn’t perform more than one function, it was left behind. The only exception was in packing a little extra high-fat foods (more calories per pound) and an extra layer of clothing as insurance against bad weather or worse. We came down the mountain only to resupply and head out again. No one complained—the alpine Sierra in the summer is without equal.

And the archaeology? Well, the first thing we noticed was that there was a lot more of it out there than you might expect. Site frequency, especially heading over 3,300- and 3,700-m passes, seemed inordinately high. I remember one plateau-like pass where we spent nearly a week frantically recording sites through afternoon thunderstorms (due to site density, we quickly fell behind our schedule) only to head over another pass and up to an amphitheater-like cirque higher than 3,300 m in elevation (a dead-end if you will) where we expected to find nothing but instead found a site covering acres. Not only was the site large, it had anthropogenic soils, abundant groundstone, and a dense surface deposit of mostly obsidian tools and debitage. It looked more like the type of site you’d find down at an elevation around 1,200 m, just below winter snowline. The more time we spent up there, the more this pattern was repeated: more sites, larger and more complex.
sites, sites with milling tools and milling features and sometimes even house features either at or above treeline. The question as to why this was the case piqued my curiosity, leading me to write my dissertation on the region’s settlement patterns (Morgan 2006). What I found most interesting about this research was that it suggested that the successful prehistoric exploitation of high altitudes was paid for, in part, by caching acorns from the montane forest as a means of offsetting the risks associated with early spring moves to the high country (Morgan 2008, 2010). Other researchers have identified similar patterns of using lowland resources to underwrite high-altitude occupations, for instance, in the White Mountains of California (Scharf 2009) and Utah’s Uinta Mountains (Nash 2012).

By now the die had been cast and it was not long before I found myself doing similar research in places like Wyoming’s Wind River Range. Here I was lucky enough to get involved in working with Rich Adams (Colorado State University), Ken Cannon (Utah State University), and Rich’s then-students Matt Stin and Bryon Schroeder to try to explain why there was a site (found by Adams and his volunteer crew) with 52 house features at an elevation of 3,300 m, a pattern at least superficially similar to other places in the American West: the high-altitude “villages” of central Nevada (Thomas 1982) and eastern California (Bettinger 1991).

Over the course of three seasons of running field schools there, funded by the National Geographic Society, the National Science Foundation (#BCS-1302054), the Charles Redd Center at Brigham Young University, and Utah State University (cobbling together the funding for this research was indeed its own challenge), I came to appreciate not only the uniqueness of the site, but also the ecological context of living and working at altitude. First, there’s the elevation. The site is on a 23-degree slope, and I spent three summers running up and down that slope keeping track of excavations spread out across the site’s 19-acre area. Barring the physiological changes (especially increased pulmonary capacity) associated with isolated populations in places like Tibet and the Andes, you do acclimate some, but you are always sucking wind above about 2,700 m in elevation. Second, people react to high altitudes differently. I remember being awoken in the pre-dawn hours by a student wheezing outside my tent, croaking, “Dr. Morgan, I don’t feel so good.” Recognizing the voice as one of the toughest students of the bunch, I was shaken. He showed all the signs of pulmonary edema: headache, shortness of breath, confusion, and deep rasping in the lungs. The only choice was to hike him down the mountain, drive to Jackson Hole so that he could be picked up by family, turn around, drive back to the Wind River Range, and hike back up to the site for the next day’s work. The doctors confirmed the edema, commenting that another few days up there could have been fatal.

Two summers later, I brought the largest crew yet to the site. At its maximum, we had 17 people in camp, with all the food, gear, wall tent, woodstove, and excavation gear once again brought up by pack train (Figure 2). Like the work in the Sierra Nevada, we were time-constrained, partly by the short summer season, but mainly by a limitation some people may not immediately think of in the mountains: water. We camped high on the mountainside, where the only water came from a few small springs. While one tended to trickle all summer long, it was only in late spring and early summer that there was a strong enough flow to sustain a large group. So up we went, as usual timing our trip with a close eye on the spring thaw and the possibility of late season storms. We’d been lucky the preceding two years and were hoping to pull off just one more field season in the notoriously unpredictable Winds. Of course it snowed. And then it snowed some more. We all packed into our wall tent with a tiny woodstove to stay warm and dry. Going stir-crazy and not wanting to miss the opportunity to dig the site, we went to work whenever the snow let up. It was something to do, it kept you warm, and it got the work done (Figures 3 and 4). The crew was resilient, punching though an inch of ice at the spring in the middle of the day to get drinking water and digging through a foot of snow to get to the tarp covering where we’d left off excavation the day before. There were cold feet and cold hands and some painful falls on the ice, but everyone had at least decent backcountry gear and lots of layers (easier to accomplish when the mules haul it in for you).

Figure 2. Wind River pack train led by Heath and Sarah Wolman of Bear Basin Outfitters, Fort Washakie, Wyoming, and by local expert guides Tory and Meredith Taylor.
More importantly, it was calories that kept people going. I was lucky enough to have hired Shawn Patton as a cook, a friendly, pragmatic man with a lot of outdoor experience, and by now I’d been bringing crews into the wilderness, feeding and taking care of them for well over a decade. So we knew to bring a lot of food. But I have never seen people eat like that. It was cold, and the snow made getting to and from the site easily twice as hard. Shawn kept the stove going, ready with coffee, cocoa, pasta, beans, and anything with fat in it as soon as we returned from work. The food was inevitably gone in seconds and supplies began to dwindle. Shawn and I eyed our stores each morning with knitted brows. But the weather eventually cleared, the food held out, and we accomplished what we had set out to do. By the end of the project, between Adams’ (2010) and Koenig’s (2010) work and my own we had sampled nearly half of the 52 houses at the site. Analyses are still underway, but it is now clear that the main period of site occupation was between about 2000 and 500 cal B.P. (Morgan et al. 2012) and that this occurred during a period of increased effective moisture when treeline was higher than today by 100 m or more (Morgan et al. 2014), making the site less in the alpine than the subalpine zone when most of its houses were built. These preliminary findings lend credence to Stirn’s (2014) hypothesis that sites like High Rise Village represent people mapping on to whitebark pine (Pinus albicaulis) and the pine nuts this tree produces. If true, this would be somewhat analogous to the Paiute and Shoshonean pattern of camping in lower elevation piñon pine (Pinus monophylla) nut camps in the Great Basin, but at much higher elevation and in the summer instead of the fall. Importantly, it implies that the pattern was driven by accessing low-return but abundant plants more than high-return animal resources.

Most recently, I’ve been fortunate enough to become involved with the excavation by Drs. Gil, Neme, Otaola, and Giardina (of the Grupo de Arqueología in San Rafael, Argentina) of a high altitude village site with 29 house features in the southern Andes. By now, the pattern should be familiar: packing food and gear in on horseback (50 miles one way; quite the experience for a novice rider!), dealing with rapid, unpredictable turns in the weather, and encountering rock-lined hunter-gatherer houses with deep midden in a beautiful but unforgiving landscape (Figure 5). And this really drives home the point I’m trying to make. Of course there are incentives to living at altitude. For the archaeologist, it’s the opportunity to try to explain how and why people chose to live in such extreme settings. For people in the past, it was surely the good hunting (lots of guanaco bone in that site in the Andes) but also perhaps the opportunity to exploit seasonally abundant plant foods like the whitebark pine nuts in Wyoming’s Wind River Range. Surely getting out of a cramped, dirty winter camp, out of the spring mosquitoes and into the beauty of the high country was incentive as well. But what is more telling are the costs of doing so. Hypoxia is always a problem for elevationally transhumant populations. Accomplishing what you want to at elevation is always constrained by season; the higher you go, the narrower the window of opportunity. Weather is unpredictable and requires insurance, in the form of extra and multifunctional gear,
extra food, extra fuel, and logistical flexibility. Add to this economies of scale—that is larger populations—and the implications are clear. Keeping people fed, dry and warm in alpine settings (and altitude’s analogue, high latitude) not only takes a lot of planning, gear, and calories, but also carries with it significantly higher risks of failure than those in most lower-elevation settings. Thus, it’s not that there aren’t incentives to living and doing research in the high mountains, but that there are uniquely high costs associated with doing so, especially in the context of larger group sizes.

References Cited

Adams, Richard

Aldenderfer, Mark

Bettsinger, Robert L.

Canaday, Timothy W.

Jackson, Thomas L., and Christoper Morgan

Koenig, Orrin

Morgan, Christopher
2006 Late Prehistoric Territorial Expansion and Maintenance in the South-Central Sierra Nevada, California. Unpublished Ph.D. dissertation, Anthropology Department, University of California, Davis.


Morgan, Christopher, Richard Adams, and Ashley Losey

Morgan, Christopher, Ashley Losey, and Lukas Trout

Muir, John

Nash, Robert B.
2012 The Role of Maize in Low-Level Food Production among Northern Peripheral Fremont Groups in the Northeastern Uinta Mountains of Utah. Unpublished Ph.D. Dissertation, Department of Anthropology, University of California, Davis.

Scharf, Elizabeth A.

Stirn, Matthew

Thomas, David H.

Walsh, Kevin, Suzi Richer, and J.L. de Beaulieu