Experimental Archaeology: What Can We Learn in the Long Run?

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Introduction

Behavioral Ecology first gained prominence as an explanatory tool in the biological sciences. Simply stated it tests the hypothesis that behaviors of biological organisms are shaped by natural selection. The fitness of those whose behaviors optimize mating opportunities and/or the provisioning offspring should be higher than those who do not. Archaeologically this approach, applied to human behavior, is best represented in studies that apply models based in Optimal Foraging Theory.

Experimental archaeology can provide insights into the behaviors of prehistoric people by attempting to replicate various activities using tools and methods similar to those used in the past. In doing so we can calculate associated cost and benefits. Archaeologists routinely recover artifacts and organic materials (macrofossil, pollen, seeds, and starches), that are the physical remnants of subsistence activities. Data gathered through experiments can then be interpreted to better understand prehistoric provisioning, settlement patterns, and seasonality.

Targeted Wild Resources

Four plants that are known to have been part of the prehistoric diet were chosen for our experimental study and are listed below. Return rates have been established on all of the targeted resources but our collecting and processing experiments are expected to augment existing data (Kcal/hr). Previous results have been based largely on one, or a handful of collecting and processing bouts within a single season at a single location or patch. The long range strategy of this study should allow us to better understand year-to-year variability in patch productivity due to weather constraints.

Achnatherum hymenoides (Indian rice grass) is a drought tolerant perennial bunch grass that produces small seeds. Rice grass thrives in sandy well-drained soils. Seeds store well and could be used ground or boiled.

Elevation: 4,200′-9,500′
Rainfall: 6″-16″ Frost Free Days: 90
Harvest : May-early July Ripened seeds drop quickly.

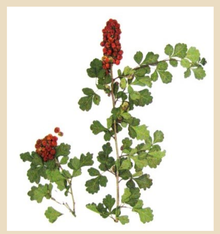
Calachortus nutallii (sego lily) is a perennial herb found growing in dry soil in grassy or shrub-covered areas. The walnut-sized bulbs can be eaten raw or cooked or can be dried and ground into a flour.

Elevation: 4,900′-9,200′
Rainfall: 6″-16″ Frost Free Days: 90
Harvest : May-early July Slow growing.

Pinus edulis (pinyon pine) seeds are highly nutritious. Tree produces every 4-7 years. Crop ripens over a 26 month period. A large tree in a good crop year can produce ~20 lbs. of seed. In better stands production might be as high as 300 lbs/acre.

Elevation: 4,500′-7,500′
Rainfall: 9″-27″ Frost Free Days: 90
Harvest : September - Green cone harvest late summer.

Rhus trilobata (three-leaf sumac) is a perennial, drought resistant shrub that produces densely packed, sour red fruit. *Rhus* prefers coarse textured soil and can be found growing along streams and on the slopes of the canyon. Prehistoric use as food, fiber, and medicine.



Elevation: lower elevations to 8,000′
Rainfall: 8″-20″ Frost Free Days:140
Harvest : May-July Fruit persisting in dried form into winter.

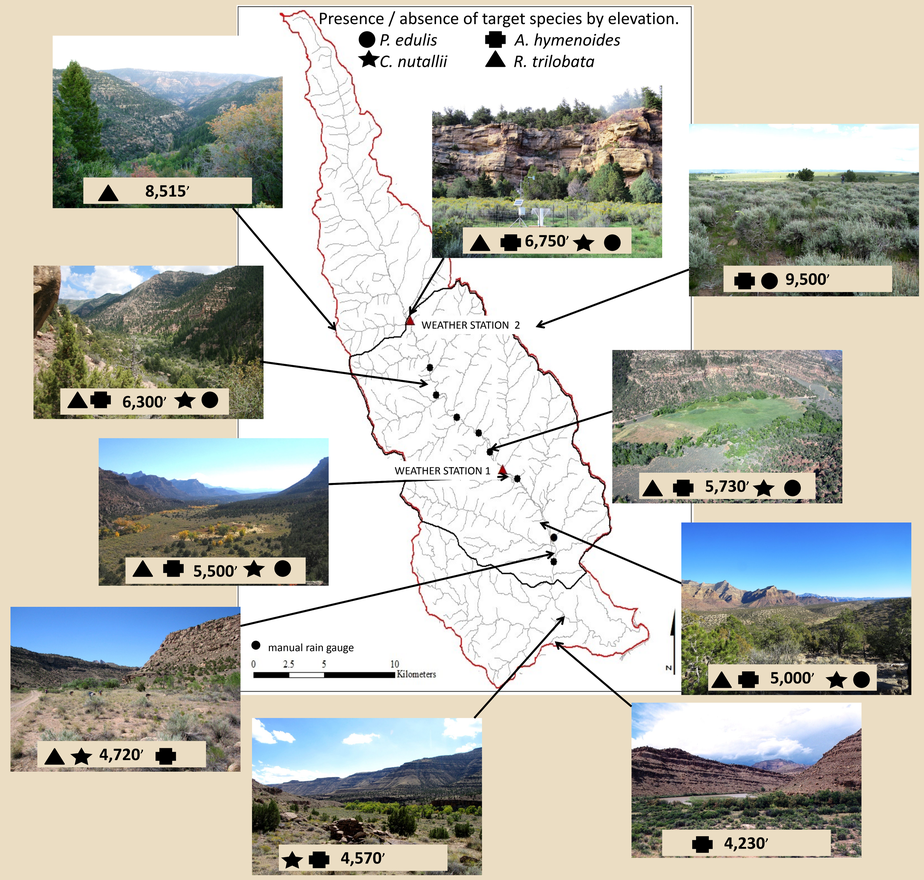
Range Creek Canyon

From pine and aspen forests at the 10,000′ headwaters of Range Creek to the juniper and greasewood habitat at its 4,230′ confluence with the Green River, there are several identifiable plant ecosystems in the canyon. Local environmental conditions (e.g. soil type, elevation, aspect, rainfall) govern local plant communities and not all of the plants targeted by this study can grow in all parts of the canyon. The first task was to identify the presence or absence of each species at various elevations and soil types and then to map those patches. A simplified rendering of preliminary data showing the distribution of targeted species can be seen on the map below.

Multiple patches of each species have been identified along the length of the canyon and on the plateau above. The time depth afforded by this study will allow us to monitor these patches to collect data on yields, harvest dates, and length of harvest. The objective is to track year-to-year variability in patch yields due to fluctuations in rainfall and temperatures and to accomplish this we will use data collected by two fully equipped weather stations. Weather Station 1 is located mid-canyon at an elevation of 5,500′ and Weather Station 2 is located at the northern boundary of the field station at an elevation of 6750′.

We are also interested in determining the timing of harvests at different elevations. For example, when is it time to harvest rice grass at the confluence of Range Creek and the Green River (4,230′) verses harvest dates for the same resource at the north gate of the field station (6750′), or on the plateau (9,500′) and how might that factor into the logistical decisions of prehistoric farmers/foragers?

Range Creek Canyon Hydrologic Boundaries



This map shows the hydrologic boundaries of Range Creek Canyon. The field station consists of approximately 3000 acres in scattered parcels along the floor of the canyon. The black boundary denotes the north and south boundaries of the field station and adjacent public lands, primarily administered by the Bureau of Land Management. Photos taken at different elevations show the remarkable diversity of local environmental settings and denote target species known to grow at these locations.

Harvesting Experiment – Year 1

Year 1 harvesting experiments consisted of two *A. hymenoides* (Indian rice grass) harvests at two different patches and a single collecting round of *R. trilobata (*three-leaf sumac). Our first patch of rice grass was located in the southern part of the canyon and collected on June 14, 2013. It was immediately apparent that we had waited to long to begin our harvest because much of the seed had already dropped from the panicles. Lesson 1: closer monitoring is required. One person was assigned to be the timekeeper and photographer then student and staff participants dispersed through the rice grass patch for several 15 minute collecting bouts. Collectors found that some of the seeds were still attached, especially on the lower panicles but they could only harvest a few seeds per plant and spent considerable time moving between plants. Three days later the group harvested a patch of rice grass 520 feet higher in elevation and 5 miles (8 km) to the north. The seeds in this patch were ripe and still fully attached. Participants were able to collect more seed in less area. Students reported, and results showed, that properly timing the harvest resulted in handling more seed in a smaller area rather than searching for seeds across a larger area.

Staff and students of the University of Utah Archaeological Field School collect *A. hymenoides* seeds (above) and *R. trilobata* drupes (below right).

R. Trilobata (three-leaf sumac) drupes were also collected from an adjoining patch. The berries had turned a deep red and were ready for picking. Unlike rice grass, the clustered drupes persist on the branches so timing the harvest is not as critical as dried berries will cling to the branches into the winter months. Instead the concern here is to access the harvest before the bears can as this is a favorite in their diet. Of course the return rate on a bear is much higher than returns from a berry patch so finding a bear would be a welcome addition to the cooking pot.

One promising patch of *C. nuttallii (*sego lily) had been identified in 2010 and some preliminary density estimates had been compiled. This patch is located mid-canyon at elevation of 5,700′. Unfortunately, this patch failed to produce in 2013. Despite numerous visits to this location only two blooming sego lilies were found. Three possible explanations for the absence of sego lily in an area where they were once abundant are 1) a lack of water due to a relatively dry winter and an extremely dry spring; 2) damage to patch resulting from a 2012 wildfire; or 3) bulbs were killed by herbicide applied prior to reseeding the burned area. We will continue to monitor in hopes that the patch will rebound.

We were unable to find any producing *P. edulis (*pinyon) groves in the canyon but will continue to monitor for signs of the next crop. This species produces sporadically and a crop matures over 26 months but it has the highest return rate of any of our targeted species or any wild plant species for that matter. The return rate for processed pine nuts ranges from 841-1408 cal/hr.

Future Research

The 2013 field season was the first year for this experimental project and many lessons were learned not the least of which is **TIMING IS EVERYTHING.** The success of at least one harvesting experiment was negatively impacted by arriving after seeds has started to drop. We also learned that timing is also important from a scheduling aspect. These experiments are time intensive.

We will continue to define the ranges of the wild resources of interest by ground truthing and then construct a map using ArcGIS. This layer is likely to be an extremely interesting overlay to current maps showing site locations within the canyon.