Sabbatical Report – Margaret Helzer

Introduction

As a paleoethnobotanist, my research focuses on the identification and analysis of charred wood, seeds, and other macrobotanical remains extracted from archaeological sites. The primary goal of my sabbatical was to conduct laboratory analysis of charred plant remains collected from Rimrock Draw Rockshelter and to begin writing up the results in preparation for publication in a scholarly, peer-reviewed journal. Rimrock Draw Rockshelter is an archaeological site located in Harney County, OR that provides evidence of human occupation stretching through the early Holocene and into the Pleistocene. Volcanic tephra associated with a 15,000 year-old eruption of Mt. St. Helens volcano was identified in the excavation. Excavations at the site will continue this summer (2014); analysis of the data is ongoing.

Project Background:

In the fall of 2011, I was invited to join Bureau of Land Management (BLM) archaeologist Scott Thomas and University of Oregon archaeologist Dr. Patrick O'Grady on research they were conducting at Rimrock Draw Rockshelter, located near the town of Riley, Oregon. Initial excavations at the site revealed that Rimrock Draw had the potential to be one of the more significant archaeological sites in North America. Projectile points and other stone tools recovered suggested an ancient human occupation site dating back as far as 12,000 – 13,000 years ago, a time often associated with Clovis technology (a highly distinctive thrusting spear point technology that was wide-spread in North America at 13,000 years ago but lasted only about thousand years or less).

Sediments at the site were deep (2 -3 meters) and they contained fire hearths where charred wood and other plant remains were preserved. This provided an opportunity to investigate and reconstruct paleo-climatic changes in the region. Vegetation near the site today is characterized by sagebrush steppe with a few scattered juniper trees in the distance. There is a dry lakebed nearby and a dry streambed that runs close to the rockshelter. In ancient times, the lake and the streambed would have been filled with water and the landscape and vegetation would have been quite different than it appears today. Identifying the charred botanical materials in the deposits can lead to a better understanding of the past environment, as well as the plants people used in the past for food, medicine, and fuel.

The University of Oregon Archaeology Field School conducted large-scale excavations at Rimrock Draw Rockshelter during the summers of 2012 and 2013. My field class in Paleoethnobotany was offered in conjunction with the archaeology field school. Students learned how to collect soil samples from the fire hearths,

process the samples using soil flotation methods, and identify the charred fragments of wood and seeds by using microscopes set up in our field lab.

The purpose of my sabbatical was to continue the laboratory analysis of botanical remains collected from the site and begin writing up the results for publication.

Objectives outlined for the sabbatical:

-identify and analyze charred plants remains (charcoal, seeds, twigs, and roots) found throughout the deposits in the site for the purpose of reconstructing past climates in the region
-carefully choose charred wood and charcoal samples found in association with significant hearth features or other artifacts in the site for the purpose of establishing dates of occupation via radiocarbon analysis
- identify and analyze charred plants remains (charcoal, seeds, twigs, and roots) found throughout the deposits in the site that would inform us about culturally significant plants used for food, medicine, or fuel
-correlate evidence for culturally significant plants with one of the earliest human occupations in the Americas

Methods/Activities

Macrobotanical analysis at Rimrock Draw Rockshelter involved identification of charcoal samples collected during excavation, as well as analysis of bulk soil samples collected directly from hearth features and stratigraphic columns in the excavation units. Soil samples were processed by flotation procedures in which botanical remains were recovered, as well as small fragments of bone, shell, and lithic material.

Soil Flotation:

The steps for soil flotation and identification of seeds, charcoal, and other plant material conducted in this research are outlined below. The decision to standardize the sample size was made to facilitate easier comparisons of the data.
1. One liter of soil from each soil sample was added to approximately three gallons of water in a five-gallon bucket. The water was stirred vigorously by hand until a strong vortex was formed and botanical remains floated to the surface.
2. The material that floats to the surface of the water is called the light fraction. The light fraction was poured out of the bucket through a 150 micron (.25 mm) mesh sieve. More water was then added to the bucket and hand mixing continued. This process was repeated 3 to 5 times until no visible light fraction was observed floating on the surface and the color of the water was relatively clear (i.e., clays and silts were washed through the screen).
3. The remaining sediment that sinks to the bottom of the bucket is called the heavy fraction. After the light fraction was caught in the .25 mm screen, the heavy fraction

was poured through a 250 micron (.5 mm) mesh sieve. Sediments and artifacts larger than .5 mm were captured in the screen and set aside for further study.
4. Both the light fraction and the heavy fraction from each sample were transferred to paper and placed on a rack for air-drying. Care is taken in this step to ensure that all remaining residue captured in the screens is transferred to the paper and appropriately dried.
5. After the samples dried (24-48 hours), they were passed through a graduated series of dry sieves with openings of 2 mm, 1 mm, .5 mm, and .25 mm, respectively. This step is important because it results in the sorting of dried samples into size categories, which eases the task of removing important contents from the remaining sediment.
6. Light and heavy fractions from each sample were then scanned under a binocular stereo microscope with 10x – 70x zoom optics. Macrofloral materials, such as seeds, seed fragments, and charcoal were removed from the sample, counted, weighed, and identified.
7. Charcoal larger than 1mm in size were counted, weighed, and identified to genus or species level. Analysis of charcoal was conducted by examining the cross-section of each piece of wood with the help of a 70x binocular microscope. Higher magnification of up to 200x was often necessary to obtain proper identification of charcoal. In cases where no charcoal over 1 mm was recovered from a sample, analysis of smaller fragments were attempted.
8. Identification of seeds and charcoal were conducted with the aid of a modern reference collection in my possession, as well as various reference identification books and resources.

Research and Collaboration:

Although much of my time during this sabbatical was devoted to research in my home lab, it was also important to collaborate with other researchers involved with the site. I worked closely with archaeologists Dr. Patrick O'Grady at the University of Oregon, Scott Thomas at the BLM in order to review emerging analyses and interpretations of the site. We worked together to prioritize which botanical samples would become the focus of my analysis and which charcoal samples to reserve for radiocarbon dating.

My work with paleoethnobotanist Jaime Dexter has also been crucial. Jaime is a PhD candidate at the University of Oregon. Her dissertation focuses on paleoecology and botanical studies associated with three early caves sites in the Northern Great Basin. In July 2012, Jaime and I collected 90 soil samples for pollen analysis at Rimrock Draw Rockshelter. She is also analyzing phytolith and starch grains from groundstone recovered at the site. Jaime's microbotanical data and my macrobotanical data will combine to paint a vivid picture of past climatic and environmental conditions associated with Rimrock and the surrounding area.

Other Activities:

My research at Rimrock Draw Roskshelter is a multi-year project that requires a broader knowledge of native plants in Oregon, archaeology of the Great Basin, new developments in our understanding of the peopling of the America, and other related topics. The following is a list of some of the activities I participated in before and during my sabbatical to maintain and enhance my knowledge in these areas.

-fieldwork at Rimrock Draw Rockshelter during the summers of 2012, 2013, 2014
-field trip to Malheur National Wildlife refuge to study plants 2012, 2013
-spend a day in the herbarium at the Malheur Wildlife Refuge, 2013
-attend the Paleoamerican Odyssey Conference, Santa Fe, Oct 2013
-attend The Confederated Tribes of Grand Ronde History Conference, Nov 2013
-field trip to Oregon State University Herbarium, Jan 2014
-give presentation to Native Plants Society of Oregon, McMinnville, April 24, 2014

Results

My research at Rimrock Draw Rockshelter will continue over the next year. Excavations at the site will resume this summer (2014) and I will teach a three-week paleoethnobotany field class as part of this process. More botanical samples will be collected as the excavators reach the bottom portion of the deposits. In many ways, the work that we are planning to undertake this coming summer will represent the culmination of our 4-year project. When I initially wrote the application for my sabbatical, I thought that the 2013 field season would be the last at Rimrock and that I would be processing the last of the soil samples over the winter of 2014 and working on a summary of the results. Although I processed and analyzed a great number of samples from the site, our work is not complete. Thus, the results I present here are still preliminary.

The attached spreadsheet contains results of charcoal identified from select units in the site. What is perhaps most striking about the data is that it shows that *Artemisia* (sagebrush) was the preferred fuel source material throughout the human occupations at the site. I had initially expected to see less evidence of plants associated with xeric conditions as we got deeper into the deposits. That is, I assumed that there would be more evidence from the 'background' charcoal of a climatic shift over time. I expected that the deeper deposits would produce charcoal associated with species more adaptive to wetter climates.

Interestingly, however, evidence for wetter conditions are present in the site, but it seems to be more concentrated in the features. The bulk soil samples collected from distinct hearth features deep in the deposits contain ample evidence of wet conditions. Woody material from these samples contained *Artemisia*, but also deciduous trees and shrubs such as *Salix* (willow) and Rosaceae (members of the Rose Family), indicative of moist conditions. Charred seeds from these flotation samples include *Scirpus* (bulrush), *Amelanchier* (serviceberry), and *Prunus*

virginiana (chokecherry), all pointing to a time when the local environment would have held more water in the channels and lakes that today are dry. The most surprising seeds I discovered in some of the samples were *sagittaria latifolia* (wapato). Wapato is sometimes referred to as "Indian potato" or broad-leaved arrowhead. Native Americans relied on this plant for its root bulb. The plant grows fully immersed in shallow lakes and ponds. It pushes shoots up through the water and produces a beautiful flower that blooms above the surface. Wapato grows on the east side of the Cascades, but is much more common in the Western valleys. Although the samples do not contain obvious evidence of processed and charred wapato bulbs (needed for evidence of food processing), the presence of the seeds strongly suggest standing water near the site during ancient times.

These data will be compared with the pollen record currently being generated by Jaime Dexter at the University of Oregon and the geochemical analysis of soil from the site and the surrounding region currently being conducted by Joe Collins, PhD candidate at the University of Texas El Paso. Together, our data will paint a clearer picture of the climatic shifts in the region over the past 15,000 years and generate a better understanding of the plants ancient peoples relied on for food, shelter, and warmth.

I have been invited to present my results in two separate symposia at the 34th Great Basin Anthropological Conference in Boise, ID in October, 2014. The papers will be co-authored with Jaime Dexter and will focus on paleoethnobotany methods and paleo-ecology associated with ancient human occupation sites in the Great Basin. Writing and publication will follow.

Reflection

I am deeply appreciative to have been awarded this sabbatical. It has provided me a rare opportunity to fully devote my time to research as a paleoethnobotanist. It not only deepened my understanding of human life in ancient times at Rimrock Draw Rockshelter, it helped me further develop my skills in identifying charred wood and seeds generally. I returned to campus rejuvenated and eager to transfer my enthusiasm into the classroom.

The sabbatical also helped facilitate and strengthen the ties between the University of Oregon and Lane Community College, a crucial step for our students interested in establishing connections with professional archaeologists in the state. When students are exposed to on-going research in the discipline and have access to professionals in the field, they are more likely to pursue new experiences.