**Sediment Profiles, Pollen Cores, and Archaeology**

Presentation for the Dixie Archaeological Society

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Matthew Zweifel earned his BS degree in Anthropology at Oregon State University in 1981. He went on to get an MA in Archaeology at Washington State University in 1994. He has worked in Oregon, Washington, Montana, Idaho, Arizona, Utah and California for the Forest Service, the BLM, various universities, private consulting firms, and as a private archaeological contractor. He spent about a year as the Tribal Archaeologist for the Kaibab Paiute. His research emphasis has been on the biological remains found at archaeological sites. He is currently the archaeologist for the Grand Staircase-Escalante National Monument. He has been working there since 1998.

He gave a technical presentation more towards the scientific end of archaeology. He presented sediment profiles and what you can learn about a site by what is trapped in the dirt besides the artifacts. The dirt tells stories.

Matthew Zweifel encouraged members to ask questions during his presentation. He said it forces him to think on-the-fly and from angles he might not have considered.

Why do archeologists care about dirt? “When we think about archeologists, we think about artifacts,” Zweifel said. “Artifacts are nice, but their location in that dirt pile and their relationship to other artifacts within the dirt pile is what really matters.” So what can we learn from looking at just the “dirt” or “sediments?”

When most people think “archaeology,” they’re thinking about artifacts, ruins, and rock art. But, what can we learn about an archaeological site without even considering the obvious parts, such as artifacts, and instead look at the sediments in which the site is found? In other words, why are archaeologists interested in the dirt?

In this presentation, we looked at examples from two case studies with which I am familiar. The first is from a site along the West Fork of the Yaak River, in NW Montana. At this location, Kootenai National Forest archaeologists discovered artifacts buried beneath an impressive set of fire and flood sediments. The artifacts were found at a depth of more than 50 cm, and deep, stratified sites are rare in this particular environment where most sites are found in the upper 30 cm or less. Analysis of the setting and sediments showed that the site was used following a major flood that swept part of the river bank clear, creating a small terrace on the outside of a bend in the river. People came to this location with a tool-quality rock and began making tools. They left large amounts of debitage that was quickly covered over with flood deposits (sand), and which was followed shortly thereafter by a forest fire, leaving a layer of charcoal on top of the sand. The fire/flood pattern continued for thousands of years, sealing the site under a “layer cake” of sediment. Analysis of the geomorphology (land form processes) revealed how the site was formed, occupied, and abandoned, and dating of the charcoal layers revealed an anthropogenic (man-caused), intentional fire regime of smaller, localized fires as opposed to the earlier natural fire regime. Much of the charcoal could be identified, showing the different forest vegetation over time, and changes brought about by historic logging and railroads. We were also able to date the site as more than 2,500 years old, and corroborate some of the fire dates by identifying the Mount Mazama (Crater Lake) ash that was included in the stratified deposits.

The second case study involves pollen cores extracted and analyzed from Grand Staircase-Escalante National Monument. A “pollen core” is a sediment core collected for analysis of the pollen contained within. Pollen “rains” down on the surrounding environment as plants release large amounts into the air annually. As it settles to the bottom of lakes or ponds, or in dry rock shelters, it forms a microscopic “layer cake” effect. Pollen can be easily identified by trained personnel, and is very often identifiable to the genus or even species level. Identification of pollen will show what plants were living in the area at the time the pollen was deposited. Pollen can, in constantly wet or constantly dry conditions, be preserved for thousands of years, providing a long-term picture of changing environments over time. In addition, materials from packrat nests were also collected to be used in conjunction with the pollen. Packrats will occupy the same nest for successive generations, adding to the nest sometimes for thousands of years. All materials in a packrat nest come from within about 50 meters (150 feet) of the nest, providing a very localized record of plants and small animal remains. Pollen, on the other hand, provides a bigger picture of the environment, as pollen can blow in from miles away. Using both pollen core materials and packrat materials from the same general location can provide a much better picture of environmental change than either can individually. In addition, microscopic charcoal found in the sediments illustrate past fire histories.

GSENM pollen cores were collected from Johnson Canyon, near Kanab, at an elevation of about 5,400’, and from the Kaiparowits Plateau, at an elevation of about 7,400’. Both locations were surrounded by prehistoric horticultural occupations; the Virgin Anasazi near Kanab, and the Anasazi and Fremont on the Kaiparowits Plateau. Results documented early natural fire regimes that were interrupted by anthropogenic fire regimes at about the same time in both locations, when the prehistoric farmers began burning the landscape as part of the preparation process for planting beans, squash, and corn. On the Kaiparowits, this pattern of burning stopped after the Anasazi moved away, but in the Johnson Canyon it apparently continued as the Paiute grew beans in that location in Late Prehistoric times. Agricultural evidence from the pollen and packrat midden samples run from Basketmaker II times through the Late Prehistoric, and include corn, beans, and squash as well as sunflower remains. Pollen evidence from both locations also show prehistoric and historic changes in the local plant community, with reductions in arboreal taxa (trees) and in increase in certain plants associated with disturbance, cultivation, and grazing.

Other findings included rates of sediment deposition that increased dramatically with the introduction of domestic livestock, with an accompanying decrease in natural grasses and the arrival of invasive species such as cheat grass and Russian thistle (tumbleweeds).

So, without considering the artifacts (other than their mere presence in the Yaak River site), and just by

looking at the sediments in which the sites are located, we could:

* Determine the age of the Montana site between 2,500 and 3,000 years old
* Determine how the site came to be formed and later preserved
* Determine past forest composition and compare this to the modern forest
* Identify plant species composition in both the Montana and Utah examples
* Identify natural fire regimes at all three locations
* Identify anthropogenic fire regimes at all three locations
* Identify vegetation changes due to human activity (prehistoric farming and historic logging, grazing)
* Positively identify a location where Late Prehistoric farming by the Paiute was taking place
* Identify cultivated crops at the Johnson Canyon location
* Identify huge sedimentation rate increases in conjunction with the advent of historic livestock grazing

Next time you visit an archaeological site and see someone sitting in a trench, staring at the sediment exposed in front of them, maybe chewing on a pencil eraser as they ponder the mysteries in front of them, you’ll have a better idea of what they are looking at and thinking about. Remember, the artifacts are important, but where they are in relation to everything else is all-important. The answers are in the dirt!