Paleofire researchers gather for Tucson meeting

By Melanie Lenart

Fire makes its mark when it blazes through a forest stand. Fire scars in trees record damage from hundreds of years in the past. Charcoal layers in lake sediments reveal the presence of fire thousands of years ago—even back into the last Ice Age.

Charcoal and tree rings

Finding a way to merge these two natural archives of fire history is a challenge practitioners agreed to begin tackling when about 65 fire ecologists and climatologists met this spring in Tucson for a weeklong workshop. The workshop was co-organized by Dr. Thomas Swetnam, a fire ecologist and director of the Laboratory of Tree-Ring Research, and Dr. Cathy Whitlock, a University of Oregon professor and a leader in charcoal-based fire history studies.

Records of fire reconstructed from charcoal layers in lake and bog sediments often stretch back 10,000 to 20,000 years, back to the time when ice sheets reached as far south as Chicago. When coupled with pollen analysis, the same sediments used for charcoal can reveal information on past vegetation. However, researchers can rarely pinpoint the exact year of a fire because worms churn the sediments and typical dating methods only provide an estimate to within a decade or two.

Tree rings can identify the exact year of a fire's occurrence, as long as at least a few scorched trees remain on the landscape. Dead wood still tells tales via its tree rings, even when it has been thoroughly charred. And by reading between the lines, researchers can glean information on past climate. Still, fire ecologists who use dendrochronology feel lucky when they can stretch a fire record beyond 500 years into the past.

Workshop participants, who included fire historians from Argentina, Chile, Australia and several European countries as well as researchers from across the United States, agreed to several tactics to help reconcile these two different but complementary records.

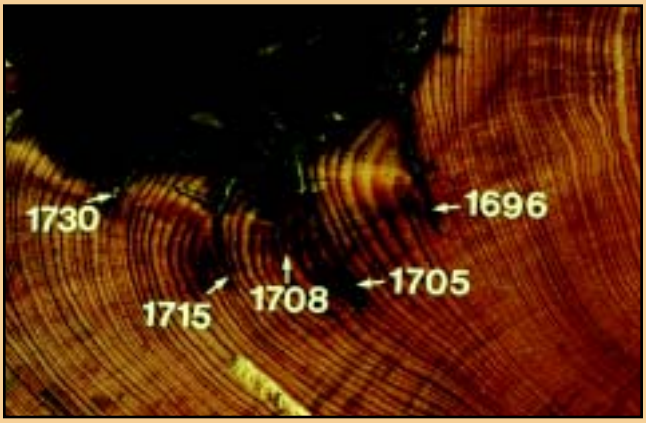

Photo by Christopher Baisan

This ponderosa pine cross-section has been crossdated, thereby yielding dates (shown in white) for the fires that caused the scars above.

First, participants hatched plans to calibrate these two approaches by sharing research sites more often. Two researchers who had already done this for an Idaho site reported good agreement between their records, for instance.

Building a better database

Participants also decided to set up an international database that would facilitate the sharing of results from individual sites and the development of networking. It will be modeled after the International Tree-Ring Data Bank.

"The way dendroclimatologists have been able to become global is to work with other scientists and to access data sets from all around the world in a common data base," Swetnam explained. "This really has been the paradigm of the last decade or two."

Swetnam and his colleagues and students have managed to coax forth a picture of regional fire patterns for the Southwest, revealing a complex link to El Niño's climatic fluctuations. But to do so took more than two decades of painstaking work reconstructing fire patterns from thousands of fire-scarred trees at dozens of sites.

Similarly, reconstructing fire history based on the charcoal record for one site around a small lake typically shows a link between hot and/or dry climate and increased fire frequency. But working on one site can consume a graduate student's attention for several years, as Dr. Whitlock's protégés have found.

Improving fire prediction

These two paleofire pioneers and others in their field have high hopes that they will be able to reconstruct fire patterns on a much grander scale within the next decade. They expect the results to reveal further connections between fire and climate.

One use of this new understanding will be the refinement of long-range forecasting of fire season severity.