

JFSP Project Progress Report

Date: December 19, 2008

Project Title: Fire Regimes of the Southern Appalachian Mountains: Temporal and Spatial Variability over Multiple Scales and Implications for Ecosystem Management

JFSP Project Number: 06-3-1-05

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Federal Cooperator: Rob Klein

Total JFSP project funding: \$299,996

Unspent funds to date: Texas A&M = \$73,440, University of Tennessee = \$41,367; Total = \$114,807. This number (for UT) may not be quite up to date.

Please provide a brief response to each of the following questions:

What have you accomplished this fiscal year?

A) Fire history and forest dynamics from tree-ring and stand data.

1) One aspect of this research is to characterize fire and vegetation history in a topographically heterogeneous landscape with a history of varying land uses in the western part of Great Smoky Mountains National Park (GSMNP). Three of the sites in western GSMNP are in low-elevation shortleaf pine-oak sites. Fire-scarred sections have been collected from 133 fire-scarred pines, of which 78% are dated. Three quadrats at each of the three sites yielded 915 cores (all of which are dated) and associated data on tree species composition and duff depth. Three chronologies were developed (one per site) using cores from 97 yellow pines collected external to the quadrats in addition to those collected within. We led a visit to one of these sites during the Second Southern Blue Ridge Fire Learning Workshop in October 2007.

Another site in western GSMNP is an unlogged, mid-elevation watershed that will permit comparisons to the low-elevation fire regime. Fire-scarred sections have been collected from 120 fire-scarred pines across the mid-elevation landscape and processing of these specimens is ongoing. Twelve quadrats were established along the topographic moisture gradient, with three quadrats in each of four topographic categories. Forest inventory data and duff depth were collected for all plots, but tree coring has been completed for only one of the plots.

2) A second aspect is to explore fire and vegetation history at a broader scale, i.e., at additional sites across the southern Appalachian region. Because of the time-consuming nature of the research, less detail (in terms of number of fire-scarred specimens, quadrats, etc.) can be collected for these additional sites. Nonetheless, we have collected 75 fire-scarred samples and quadrat data (two quadrats) from one of these more widely distributed sites, House Mountain State Natural Area, Tennessee. One or more additional sites on National Forest lands await collection.

B) Longer-term, coarser resolution fire and vegetation history from soil charcoal.

Six soil cores have been extracted from each of eight sites corresponding to the low-elevation plot locations (see above) in western GSMNP, for a total of 48 soil cores. The cores average 60

cm in depth and have yielded 315 individual 10 cm core sections. Of these core sections, 251 (80%) have been washed over a 2 mm sieve. All charcoal ≥ 2 mm was recovered, cleaned with distilled water, dried, and weighed. Identification of soil charcoal fragments is in progress to assist in the reconstruction of past forest composition at the study sites. Nine samples of charcoal from southern yellow pine, eastern white pine, and hardwood species were submitted to Beta Analytic for AMS dating, yielding dates ranging from modern (last ~50 years) to 2860 ± 40 years BP.

C) Spatial analysis of fire patterns using GIS data on fires that occurred in GSMNP and Shenandoah National Park (SNP) during the 1930s-2000s.

This analysis is nearly complete and yields insights about the interacting influences of topography, climate, vegetation, and human activities on the incidence of fire. Journal submission of a manuscript is planned for Spring 2009.

D) Analysis of fire-climate relationships across the southern Appalachian Mountains region.

The fire dataset for this analysis is the NIFMID dataset containing fires on all federal lands. The work is being conducted primarily in the context of an undergraduate honors thesis project, and is approximately 50% completed. Most or all of the remaining work will be completed during Spring semester 2009.

E) To summarize, we have developed a dense network of dendroecological fire history sites with associated vegetation data (age structure, composition, etc.) at low and middle elevations of GSMNP, while also continuing to develop a broader network across the southern Appalachian region. This network complements the large network of sites we developed in the central Appalachian Mountains for JFSP project 01C-3-3-09, and will result in one of the two largest dendroecological fire history networks in the eastern USA. The spatial and climatic analyses provide shorter-term but more detailed information that augments our understanding of southern Appalachian fire regimes, while the soil charcoal offers a longer-term perspective at lower temporal (but high spatial) resolution.

2. Are you on schedule to complete the project by the JFSP project end date?

No

If not, what steps are you taking to ensure that you can meet the deliverable date?

A) The low-elevation shortleaf pine component at GSMNP and associated Ph.D. dissertation "Fire Regimes of Lower-elevation Yellow Pine (*Pinus*) and Pine-Oak (*Quercus*) Stands in the Great Smoky Mountains National Park, Tennessee" should be completed by the deliverable date. Work is ongoing and we do not anticipate problems with the completion.

Fieldwork for the mid-elevation unlogged watershed in GSMNP and some analyses should be completed by the deliverable date. Specimens are being processed and analyzed. To improve the speed of the processing an undergraduate student is enrolled in a year-long directed study focused on the work. Also, a field research trip is planned for Spring semester 2009 to complete

the coring of the remaining 11 quadrats. We anticipate that the fieldwork will be completed before the deliverable date. However, it is unlikely that all the processing and analyses can be completed by the deliverable date.

Two field research trips will be conducted during Summer 2009 to attempt to complete the fieldwork for the broader network of fire history sites across the southern Appalachian region. However, we think all the fieldwork may not be completed by the deliverable date, and even if it is possible to complete the fieldwork, the analyses will not be completed by the deliverable date.

B) The fieldwork and most of the laboratory analyses of soil charcoal have been completed. We expect this component of the work to be completed by the deliverable date.

C) The spatial analysis of 1930s-2000s fires should be completed and submitted to a journal. The work is ongoing and proceeding well.

D) Analysis of fire-climate relationships and associated undergraduate honors thesis should be completed. Much of the work was completed during the Fall 2008 semester, and the undergraduate student involved in this project will complete the work in Spring 2009.

E) As noted in our 2007 progress report, initially our project was off to a faster-than-anticipated start in Fall 2006 because we identified readily accessible sites with high-quality fire-scarred pines and began to sample them. Unfortunately, our progress slowed considerably beginning in January 2007 and lasting until the present primarily because one of the PIs, Dr. Grissino-Mayer, developed serious health complications that required multiple hospitalizations and restrictions on strenuous fieldwork. We have been slowed further by departmental administrative duties that have affected the PIs; this level of administrative responsibility was not anticipated at the time the project was proposed. Two additional factors related to our field sites have slowed the project. The first is a positive development: the GSMNP sites have such a high density of high-quality fire-scarred samples, and are in relatively inaccessible locations, that our progress has been slowed, despite working long days to complete the sites. Fortunately the work at GSMNP is nearly completed. The second is that we have not been successful at locating sites with suitable materials for fire history reconstruction (although we have partially scouted some sites with promise) on National Forest lands, and our reconnaissance efforts on these locations has been slowed by the sheer amount of work at GSMNP.

We anticipate that it will be necessary to request an extension to our project in the coming months. We wish to emphasize that we have been and are working very hard to complete this project as rapidly as possible, and that the quality and impact of our results are shaping up to be high. We simply have encountered a number of issues (both positive and negative) that have slowed our progress, and at this point the completion of all aspects of the project by the deliverable date appears to be unlikely.

3. Do you have any other issues or concerns with your project (e.g., issues with sub-agreements)?

Last year we expressed some frustration with the delays in processing travel reimbursements by the Texas Agricultural Experiment Station (TAES). This situation has improved, although TAES is still a bit unwieldy for administering this project because it is set up for a different type of research (e.g., one-day trips or staying in hotels, instead of multi-day research expeditions involving backcountry fieldwork).

Another item to note is that the National Park Service (Gulf Coast CESU) often is late in paying invoices submitted by TAES. To date this has not impeded our research; hopefully it will not become a cause for greater concern.

Finally, we have not been able to obtain as much field help from our federal partners as we had hoped. We understand that they have many demands on their time, of course. However, based on our previous experience with the George Washington and Jefferson National Forests (for our JFSP-funded project 01C-3-3-09) we had counted on having more field assistance. Unfortunately the situation has been exacerbated by a temporary dip in the number of graduate and undergraduate students we have had available to help in the field, compared with the larger number of students we had available to help with project 01C-3-3-09.

On the other hand, we are very grateful for the help that our federal partners at GSMNP have provided in terms of housing in the park. This housing has helped tremendously by providing a conveniently located and comfortable base for our field operations in the park.

4. Do you have any comments or concerns that may help JFSP better administer your project?

Note: the amount of remaining funds reported above may be slightly out-of-date.