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LETTERS TO THE EDITOR

Comment on Dating Forest Disturbances

The technique of dating catastrophic forest disturbances by estimating establishment dates for stands of even-aged trees has been used by several researchers (Clements, 1910; Heinselman, 1973; Tande, 1977). We believe this technique has a sound and reasonable basis and that it can provide very useful ecological data. However, the appearance of the Hemstrom and Franklin (1982) article has stimulated us to point out that there remains something to be said concerning the dating of forest disturbances by means of tree-ring counts and also the application and interpretation of these dates.

Consider several aspects of the methods employed in this study and the questions they raise:

1. The authors determined age structure of forest stands by counting annual rings of selected trees. Some of the trees exceeded 500 years in age and many of the ring counts were conducted in the field on unprepared surfaces of stumps. Counts of such long tree-ring series on unsanded surfaces would very likely result in some error. The authors stated that counts were repeated for individual trees until they were within plus or minus ten rings. Does this mean that the age structure data is accurate to within plus or minus ten years? Probably not, because the authors did not crossdate any of the sampled ring series; therefore locally absent or false rings may have resulted in additional error in the age estimates. How accurate then are the age-structure data?

2. Data from a test transect through an area where a fire was known to have occurred in 1886 were displayed in Figure 3. According to the distribution of ages depicted in this figure, the "pulse" of reproduction following the fire does not begin until about 10 years after the fire, and the peak of reproduction establishment does not occur until nearly 40 years after the fire. The authors point out the possibility of large variation in the amount of time following a fire during which regeneration occurs. Is the lag time between a fire and the beginning of regeneration consistent enough to assign single-year dates to those fires?

3. Figure 5 shows the distribution of tree ages for two drainages. The age distributions show numerous peaks and valleys but arrows indicating approximate dates of disturbances are associated with only a few of them and there is no apparent consistency with the placement of these dates. How did the authors decide which peaks in the age-distribution curves represent reproduction following a fire and how did they place specific dates for those fires?

4. The authors did not use fire-scar data to confirm or augment the fire-date estimates derived by the age-structure analyses as other researchers have (Clements, 1910; Heinselman, 1973; Tande, 1977). They stated that fire-scar analyses were impractical because fire-scarred trees were rare and aesthetic considerations ruled out felling trees or taking wedge sections within the park. While management and research constraints vary from one national park to another, collections of a limited number of wedge sections or full cross sections have been approved for fire-history studies in other national parks (Kilgore and Taylor, 1979; Ahlstrand, 1980).

The basic question that arises from these methods of dating is how accurate are the dates that are listed for the fire events and

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fire episodes? The authors have listed these dates in several locations in their paper, yet nowhere is there indication of the variance or even the estimated variance about these dates. We believe that this is a serious ommission because the validity of conclusions or applications based on reconstructed dates depends directly on the resolution of the techniques used to derive those dates. This is true whether the dating technique involves ^{14}C analysis, K/Ar analysis, dendrochronology, or forest-stand age-structure analysis.

The purpose of this letter is not to disparage the technique of dating fires and other disturbances by means of stand-age structure analysis, but rather to point out the need for specifying the level of accuracy of the dating, and the need for caution in applying those dates. Prudent interpretations are especially warranted where dates of events are compared with dates of other events. For example, comparisons of fire dates within or between study areas and comparisons of fire dates with climatic events should be interpreted cautiously, especially when dating is not accurate to the year.

The Hemstrom and Franklin (1982) study provides an example of a comparison of reconstructed dates for two events. They compared dates for fire episodes which they say are burns over 1000 ha in size and may be one or a series of fires within a short time (although they do not specify the length of time), with dates of drought reconstructed by dendroclimatology. The authors suggest that the high correlation they found between drought dates and fire dates indicates a cause-and-effect relationship. This relationship may, in fact, exist; however, the problem is that the drought periods are limited to one or a few years and their dating by dendrochronological techniques, which includes crossdating, has been shown to be very accurate (Fritts, 1976). The question is how conclusive is a comparison of fire dates having an unknown level of accuracy with highly accurate drought dates?

Finally, there is one statement we simply could not let pass. The authors stated (p. 36), "The best technique for accurately dating disturbances is counting rings on sections or wedges from scarred trees or stumps. . . ." In fact, the best technique for *accurately* dating disturbances by means of tree-ring analysis is the crossdating of ring series of scarred trees with master tree-ring chronologies, thereby accounting for locally absent or false rings (Stokes 1980).

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THOMAS W. SWETNAM
ELAINE K. SUTHERLAND
MARNA ARES THOMPSON
Laboratory of Tree-Ring Research
University of Arizona
Tucson, Arizona 85721