Basic Tree-Ring Sample Preparation Techniques for Aging Aspen

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Abstract—*Aspen is notoriously difficult to age because of its light-colored wood and faint annual growth rings. Careful preparation and processing of aspen ring samples can overcome these problems, yield accurate age and growth estimates, and concisely date disturbance events present in the tree-ring record. Proper collection of aspen wood is essential in obtaining usable ring data. Mounting of increment cores and sawn disk samples to wood backings holds samples rigid for easy surfacing. Sequential use of planers, belt sanders, and an assortment of sanding material on the surface of aspen core and disk samples can enhance visibility of tree rings. Application of stain on samples will color the late wood a dark brown and enhance the rings' visibility.*

Introduction

Many forest ecosystem research studies rely on accurate tree-ring identification to document age, fire frequencies, climate reconstruction, growth rates, and age of wind-thrown logs (Arnold and Libby 1949; Baisan and Swetnam 1990; Briffa et al. 1991; Brown et al. 1998; Swetnam et al. 1985). Several previous studies have described the methods of identifying quaking aspen (*Populus tremuloides* Michx.) annual rings (Maini and Coupland 1964; Rose 1957; Trujillo 1975). Trujillo (1975) shaved the core surface and treated it with a wood preservative and was able to distinguish the rings even after a year's storage. Others have recommended shaving the core sample to enhance ring visibility (Jones 1966; Maeglin 1979; Campbell 1981). Campbell (1981) used a vise to stabilize the core while shaving one side with a razor blade. Techniques for onsite aging of aspen cores were described by Mower and Shepperd (1987). Fresh cores were shaved, re-wetted, and viewed under a microscope for better ring identification.

In this paper we describe methods for collecting, mounting, and preparing aspen core and disk samples to accurately identify and measure annual rings using dendrochronology techniques.

Methods

Several steps are essential to collect and prepare aspen core and disk samples for use in dendrochronology research. The proper use of tools and materials is essential. Increment borers are the most widely used tools to extract tree cores (Jozsa 1988). Time and frustration of identifying ring samples can be minimized by the proper maintenance and care of increment borers. Some of the more common defects in core samples such as rough, broken, and twisted core surfaces are caused by dull or chipped borers. Improper start and directional change from a free-hand start of the borer can produce corkscrew core samples. Properly

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maintained and sharpened increment borers will save time and expense and greatly improve the effectiveness of collecting aspen tree-ring samples. Improper storage and care of the core samples can produce discoloration and decay. Cores collected in the field should be stored and transported in paper straws with the proper date and location of each sample identified on the straw. If plastic straws must be used, it is important to slit the straws to dry the cores. Unfortunately, core samples are often not collected properly in the field, resulting in difficulties in obtaining accurate ring measurements.

To properly mount the core samples, the tracheids must be mounted vertically. This will ensure maximum ring visibility after sanding. We recommend the use of grooved, wooden core mounts on which to mount the core samples to facilitate handling and sanding. As core samples are being taken, the increment borer scores lines on each side of the core perpendicular to the vertical alignment of the tracheids along the length of the core surface (Stokes and Smiley 1968). Cores should be air dried for a few days and glued into the mount so that the score lines run along the edges of the core mount. Aligning the cores in the core mounts is very important, so that the individual cells and ring boundaries can easily be seen when the cores are properly surfaced. Improperly mounted cores cause much frustration and loss of time when one struggles to identify the tree rings. Figure 1A shows a properly mounted unsurfaced core. The glued samples should be secured to the wooden mount with string wound around the mount and core (figure 2). After the glue is dry, the string is removed and the core is surfaced. A water-soluble white wood glue should be used because the core can be easily removed by steaming the mount over a tea kettle should realignment become necessary. Core samples mounted with white glue can be quickly set in a microwave oven for two minutes when time becomes an issue.

Disk samples obtained from standing or downed aspen trees with a chainsaw should be mounted on plywood backing to prevent breakage. Some disk samples

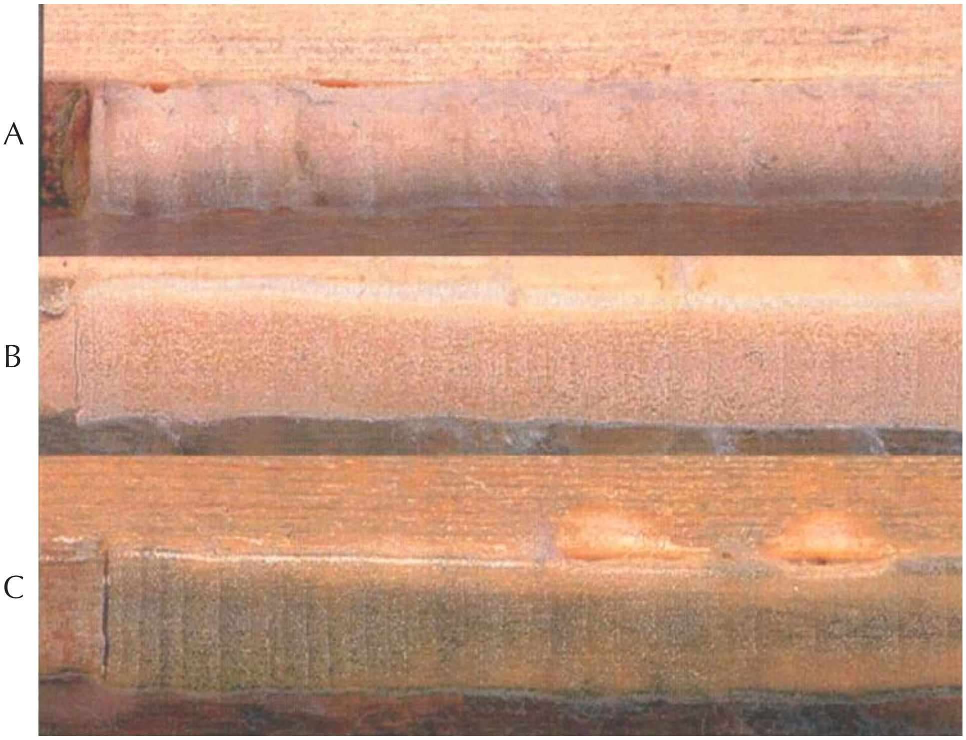

Figure 1—(A) Unsurfaced aspen core glued to wood mount, (B) surfaced and glued to wood mount, and (C) surfaced, stained, and glued to wood mount.

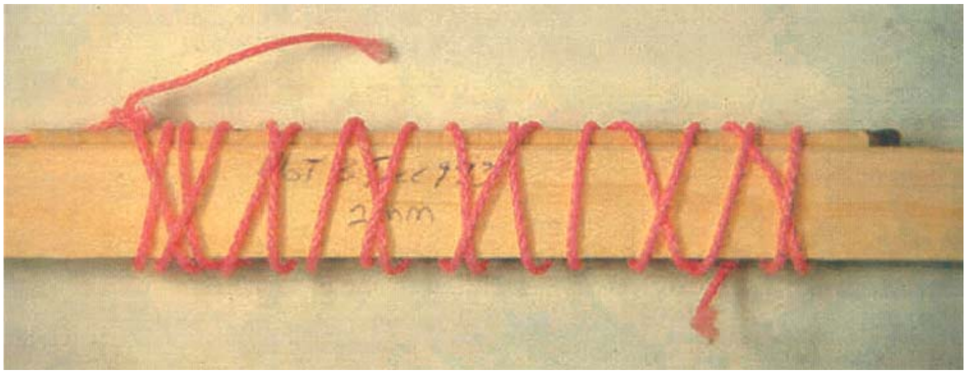

Figure 2—Aspen core glued and secured to wooden mount with string.

may be in an advanced stage of deterioration and break into small pieces. Transporting these samples intact is accomplished by drawing a series of lines with felt tip pens across each breakage point, then using plastic wrap to hold the samples together for transport. Each sample should be documented with the date, location, and sample number. Upon arrival at the laboratory, samples should be left to dry for several days. Then they should be reassembled by matching the marker lines and gluing the samples to a wood backing with construction glue (figure 3). Construction glue will secure the disk sample to the wood backing and make it rigid enough to use power equipment to prepare a ring surface.

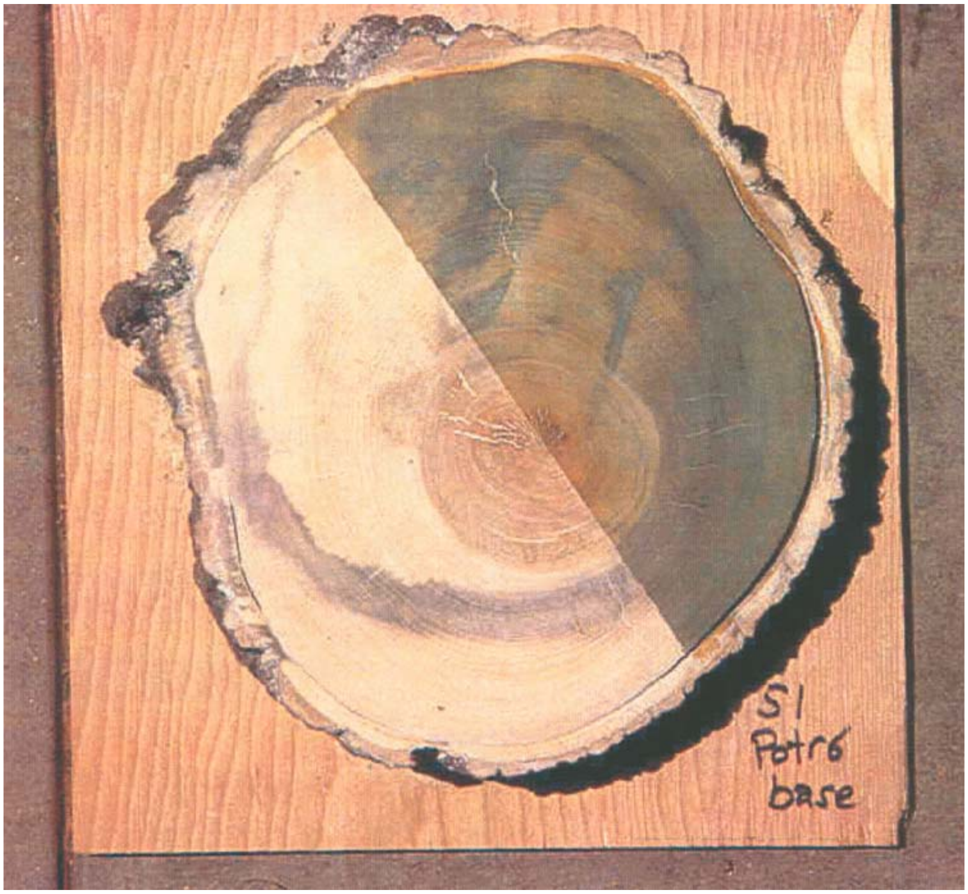

Figure 3—Surfaced aspen disk half stained and glued to wooden backing.

Equipment needed to prepare tree-ring samples includes electric hand planers, belt sanders, stains, and an assortment of different grits of sand paper and sanding belts. Mounted aspen core and disk samples should be sanded with a belt sander, using progressively finer grits of belts from 150, 240, and 320. Then they should be sanded by hand using a 400 grit sheet and finally a micro-finishing film sheet of 15 m grade. Disk surfaces should first be leveled off using an electric hand planer. Then a belt sander with progressively finer grits from 150 to 400 should be used to prepare surfaces for ring analysis.

If the thorough sanding of aspen samples is completed and the tree rings are still difficult to distinguish (figure 1B), a stain should be applied. Fehling's Solution (Forest Products Laboratory 1962) works well to distinguish sapwood from heartwood in aspen. It stains the latewood portion of the tree rings a dark brown and thus makes ring identification easier (figure 1C). The mix contains 3.5 g copper sulphate ($CuSO_4 \cdot 5H_2O$), 17.3 g potassium sodium tartrate, 6.0 g sodium hydroxide, and 100.0 ml water.

A good source for obtaining sample preparation material can be found on the web at www.valdosta.edu/~grissino/supplies.htm.

Conclusion

Aspen annual growth rings are much easier to see when samples have been prepared using these techniques. The extra effort needed to collect and prepare samples in this manner will result in more accurate age and growth determinations and facilitate the identification and measurement of tree-ring growth patterns for dating disturbance events in aspen forests.

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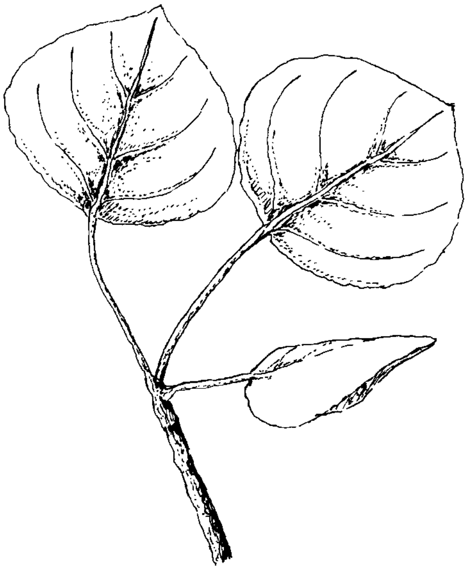

Manipulating Aspen Ecosystems