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TECHNICAL REPORT

TRIMMING AND PLANING ROUGH-CUT WOOD FOR EFFICIENT DENDROCHRONOLOGICAL SAMPLE PREPARATION AND STORAGE

J. JESSE MINOR[1,2]* and **ALEXIS H. ARIZPE**[2]

[1]School of Geography and Development, University of Arizona, P.O. Box 210076, Tucson, AZ, 85721-0076, USA

[2]Laboratory of Tree-Ring Research, University of Arizona, 1215 E. Lowell Street, Box 210045, Tucson, AZ, 85721, USA

ABSTRACT

Wood samples larger than increment cores collected for tree-ring studies are often obtained using chainsaws and, less frequently, 2-person crosscut saws. Saw marks on cross-sectional wood samples can be quite deep and uneven, and sanding rough-cut wood cross-sections is inefficient in terms of processing time and wear on sanding belts. Trimming rough-cut wood samples with a band saw or treating with a surface planer creates a smoother initial surface for sample sanding and polishing. Sample trimming with a band saw or surface planer is also useful for post-analysis archiving and wood storage, when excess wood can be removed and smaller samples entered into storage. Band saw and surface planer safety techniques are also discussed.

Keywords: sample preparation, cross-section, band saw, surface planer, methods, archival wood, trimming.

INTRODUCTION

Previously published research reports and manuscripts have formally articulated many sample preparation practices commonly used in tree-ring research (Yamaguchi and Brunstein 1991; Orvis and Grissino-Mayer 2002; Grissino-Mayer 2003; Sheppard and Witten 2005). Research reports such as these are critically useful for methods training and communication, especially in light of the recent proliferation of dendrochronology labs and the global surge in popularity of tree-ring methods. Despite a fairly robust published record of tree-ring sampling and preparation techniques, several widely used references (Arno and Sneck 1977; Schweingruber 1988; Speer 2010) do not discuss the rationale for and techniques used to trim cross-sectional samples. Additional authors who do refer to sample "trimming" (removal of thin surface veneer or excess wood) using a band saw in the Methods sections of their papers do not articulate how or why they chose this technique (Stokes and Smiley 1968; De Visser 1992; Kaye and Swetnam 1999; Bortolot *et al*. 2001; Fichtler *et al*. 2003). Surface planing as a sample preparation technique has not been formally described in the tree-ring literature.

Saw marks on cross-sectional wood samples from chainsaws and crosscut saws can be quite deep and uneven. This is particularly true if the sample was collected using imperfectly maintained equipment or if the saw was handled by an inexperienced sawyer. Improperly sharpened saws may have a tendency to cut a curve in a particular direction, creating a convex or concave surface on the wood sample. Even a well-maintained chainsaw will routinely produce grooves on a sample surface as much as 2 mm deep. Poorly-trained or inexperienced sawyers may fail to cut evenly, particularly on trees requiring multiple cuts. Mismatched cuts can create deep vertical saw marks in the sample (kerf), whereas mismatched horizontal cuts can produce thin veneers or angled kerfs that pose a difficulty to sample preparation. Convex and concave sample surfaces pose additional difficulty for proper sanding and polishing, and if

*Corresponding author: jminor@email.arizona.edu

Figure 1. Trimming rough-cut surface and unsound wood from a mounted cross-section. Adjustable blade guards on high-quality band saws promote user safety, as do personal protective equipment (ear and eye protection and a dustmask) and proper technique, such as “push sticks.”

left untrimmed, require additional expenditures of time and materials during sample preparation. Further, uneven sample surfaces provide difficulties when using a binocular light microscope for dating rings, scars, and other features of interest, as the technician must constantly refocus the microscope as the wood sample is moved below it. Sample preparation is more efficiently accomplished if the sample surfaces are trimmed or planed and smoothed prior to polishing with progressively finer-grit sandpaper. This paper fills a gap in the published literature about the efficacy, methods, and rationale of trimming samples with a band saw or smoothing cross-sectional surfaces with a surface planer prior to sanding and polishing, and introduces associated safety considerations.

MATERIALS

A large, floor-mounted band saw (*e.g.* Rockwell/Delta, Figure 1; cost approximately $1800 USD in 2015) provides the optimal combination of smooth sample surface and user safety. Floor or table-mounted band saws are heavy and stable and are equipped with an adjustable blade guard, which improves user safety. A cross-sectional wood sample surface trimmed with a band saw will generally have <0.5 mm deep grooves (Figure 2a) roughly equivalent to the surface produced by sanding with 36 grit sandpaper (Orvis and Grissino-Mayer 2002). Wood samples featuring mismatched chainsaw cuts can contain grooves greater than 2 mm and kerf marks exceeding several centimeters. Poorly cut wood samples can contain grooves greater than 2 mm and kerf marks exceeding several centimeters (Figure 2b).

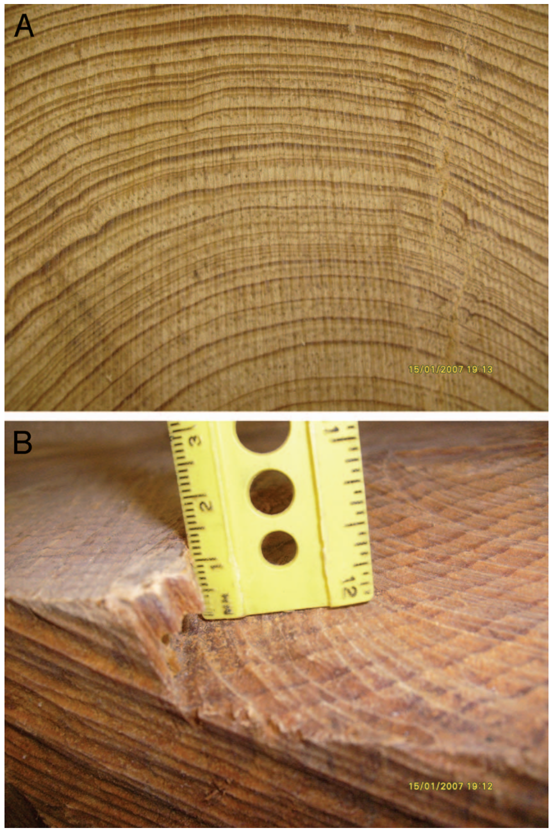

Figure 2. (A) *Pinus leiophylla* sample surface showing very shallow kerf marks (equivalent to 40 grit sandpaper) following band-saw trimming. (B) Mismatched cuts create surfaces that are very difficult to sand without prior trimming.

Large, floor-mounted band saws are equipped with an adjustable blade guard that can be set higher and lower depending on the size of the wood sample being cut (Figure 1). Maximum blade guard height influences the size of wood that can be trimmed using the band saw, and are commonly manufactured in sizes of 50.8 cm (20 inches) and 35.56 cm (14 inches). A band saw allows users to both rip and cross-cut wood, which is essential for trimming away unwanted material. Saws designed for cross-cutting wood grain are not suitable for ripping wood (cutting with the grain). Band saws can rip and cross-cut wood, and thus provide a considerable advantage in this respect.

Hand-held surface planers (cost approximately $150 USD in 2015) provide another technique for smoothing cross-sectional samples prior to sanding and polishing. As with a band saw, cross-sectional samples treated with a surface planer will have grooves of less than 0.5 mm, with sound wood producing very smooth surfaces. Unlike a band saw, surface planers do not limit the size of cross-sections that can be processed, which is especially important for large round samples or eccentrically shaped cross-sections commonly encountered in fire history studies.

METHODS

Band saws are principally useful for two types of trimming operations: cutting cross-sectional slices and making tangential cuts. Cross-sectional (transverse) trimming is used to cut away the rough surface created by a chainsaw or crosscut saw during sample collection. Transverse trimming can also be used to decrease the thickness of a field-cut sample, or to target anatomical or other features of interest in the sample. Transverse trimming can also be used to make the field cuts parallel for better viewing under a microscope, such as when wedge samples are cut with a crosscut saw or with a chainsaw without having made plunge cuts (*e.g.* methods first proposed by Arno and Sneck 1977). Improving the parallelism of field cuts reduces distortions in tree-ring widths and cell dimensions by placing transverse surfaces more perpendicular to the longitudinal stem axis. Surface planers can also be used to improve sample parallelism, but require considerably more time to remove an equivalent amount of wood compared to a band saw.

Longitudinal cutting (ripping) is another useful technique accomplished with a band saw. Longitudinal cuts can be used to separate especially large or unwieldy samples into multiple pieces. Tangential cuts provide another useful technique for cutting away unnecessary wood, or for minimizing the amount of wood in a sample.

Round samples, and particularly small-diameter "cookies" must be treated with particular caution when trimming with a band saw, as the high blade speed has a tendency to catch and spin small round samples and poses a risk to the saw operator. A fast-moving band saw blade can throw small and round samples at the saw operator or others nearby, or the sample can turn, thereby kinking and destroying or even breaking the band saw blade. If it is necessary to transversely trim small-diameter "cookie" samples, a tangential surface can be cut onto the side to provide stability to the sample as the transverse (cross-sectional) surface is trimmed. Cutting this flat surface does provide a more stable and safer base for the sample to rest upon, but may come at the cost of some of the outermost rings on one side of the wood sample. Another possibility for safely cutting rounds is to build a jig of braced triangular pieces of scrap wood that can be wedged against the round sample, or screwed to the sample to prevent rotation while cutting.

Surface planers cannot be used to trim samples transversely or tangentially, but are useful for smoothing cross-sections prior to sanding and polishing. The initial step for cross-section sample preparation is to flatten especially high "peaks" from the field cut surface. Once the sample surface is approximately flat and level, the surface planer can be used to smooth out saw marks and other irregularities. Cutting depth should be set fairly shallow, to avoid gouging out too much wood and thereby increasing processing time. Because of the mechanical action of the cutting blades, care should be taken when working near fragile edges of the cross-sectional sample, as the surface planer can knock external scars or loose pieces of wood from the sample, unless these are secured prior to surfacing (*i.e.* Hook *et al.* 2013).

To hold cross-sectional samples in place while smoothing with a surface planer, samples should be placed on a peg-board table with short dowels arranged around the sample or the sample backing to prevent the cross-section from moving underneath the machinery. For straight-edged samples or samples mounted to a backing, a square jig can be constructed to hold the sample in place (Figure 3). This technique is also recommended

Figure 3. Pegboard or a rubber mat can be used to hold samples securely for planing or sanding. Short dowels or a square jig are used to immobilize the sample.

for securing samples while sanding with a belt sander or orbital sander.

Band saws and surface planers should always be operated by users who have received proper training and who are wearing personal protective equipment, which at a minimum should include eye protection or a face shield, and also ear and dust protection (*e.g.* Figure 1). It is highly recommended that "push sticks" be used for advancing the wood sample through a band saw to increase the distance between the saw operator and the band saw blade (Figure 1).

DISCUSSION

Beyond the benefits of post-trimming sample sanding and polishing discussed above, band-saw trimming also allows researchers and technicians to reduce the size of samples. A common field technique is to collect thick samples of unsound wood, to preserve delicate features that might otherwise be lost in transit. Thick samples of sound wood can be trimmed down using a band saw prior to sanding and polishing. Special techniques for preparing and surfacing unsound wood, subfossil wood, and archaeological charcoal have been presented by Hook *et al.* (2013) and Schweingruber (1990). Fragile cross-sections, including fire history samples and subfossil wood, can be glued to a sturdy backing to prevent loss of external features (Figures 1 and 3). Band-saw trimming also allows researchers and technicians to target features along the longitudinal axis of a wood sample for presentation, such as pith, outermost rings, or scars not present throughout the width of a collected sample.

The capability to trim and adjust sample sizes becomes critical during post-research sample archiving, when space considerations and their associated square-footage costs become important (Creasman 2011). Fitting samples into archival-quality storage boxes is efficiently accomplished with band-saw trimming, because excess wood can be removed from the sample following dating and analysis.

Furthermore, good-quality band saws such as a Rockwell/Delta (Figure 1) or hand-held surface planers are equipped with dust-handling capabilities, which can be integrated into larger shop-level dust and air handling systems. Dust control is an essential consideration for wood shops and sample preparation areas, as dust production can increase fire and explosion hazards, and can impair worker health.

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