Dendrochronological assessment of the MacKinnon House

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Abstract

Two red spruce (*Picea rubens*) beams were collected from the MacKinnon house and delivered to the Mount Allison Dendrochronology Laboratory (MAD Lab) to establish cut dates for each piece. After standard preparation of the samples, they were measured and cross-dated (pattern matched) against a standard red spruce regional chronology. The samples fit the regional curves very well and dated to being cut in 1853 and 1855.

Introduction

The MacKinnon family brought two beams (08BES00) from their home to the MAD Lab in the fall of 2008 for dating. Dendrochronology is a field that uses patterns in the annual growth rings of trees to establish a chronology that samples can be dated too. Dendrochronological analysis was conducted on the two red spruce (*Picea rubens*) beams by the MAD Lab in February 2009.

Methods

The first sample 08BES001(Figure 1A) was less than half the size than 08BES002 (Figure1B). Each sample had exposed corners with the last year of growth present. Samples were sanded with progressively finer sanding paper (80-400 grit) to bring out the cellular structures and annual rings of the wood. Rings were counted and measured along two paths from the pith (middle) of each disc sample using a Velmex measuring system with an accuracy of 0.001 mm. Measurement paths were run through the most structurally sound portions of the sample (Figure 1).
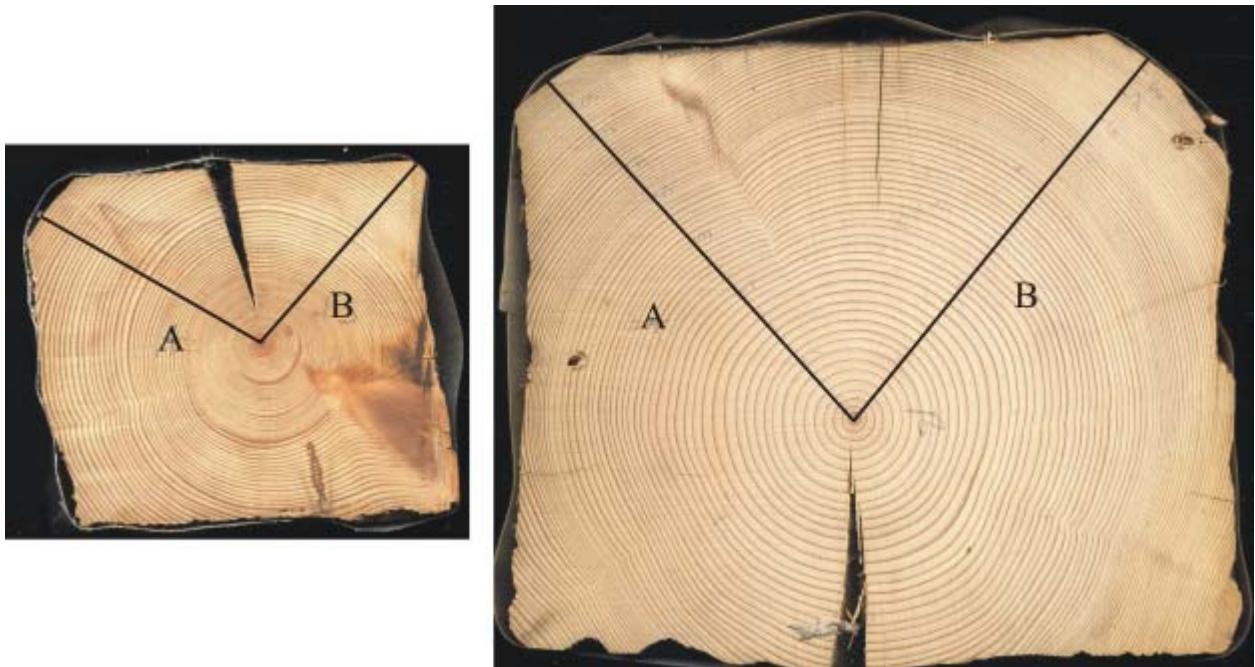

Figure 1 – A) Sample 08BES001 with the two measured A and B paths indicated; B) Sample 08BES002 with the two measured A and B paths indicated.

A time series of measurements from the barn samples were correlated to each other thereby creating floating chronologies (i.e. chronologies that are not attached to a specific period of time). Cross-dating refers to the practice of taking the pattern of growth from one sample and comparing it to that of another (Figure 2).

To assist in the cross-dating procedure, the statistical cross-dating program COFECHA (Holmes, 1986a) was used. COFECHA uses correlation values to assist in the accurate dating of samples. Higher correlation values indicate that the floating chronology corresponds well to the master chronology. Lower correlation values can indicate, among other things, ecological or climatic variation from the norm or that the sample is inaccurately dated. The floating chronologies created from the two samples were run against a red spruce (*Picea rubens*) regional master chronology available from the MAD Lab archive. This ensured that the patterns found in the floating samples could be referenced to the chronology that is locked in time.

Each of the floating and master chronologies was standardized to have a mean of one by using a negative exponential curve in the program ARSTAN (Holmes, 1986b). This standardization was completed to allow samples of different ages to be compared.
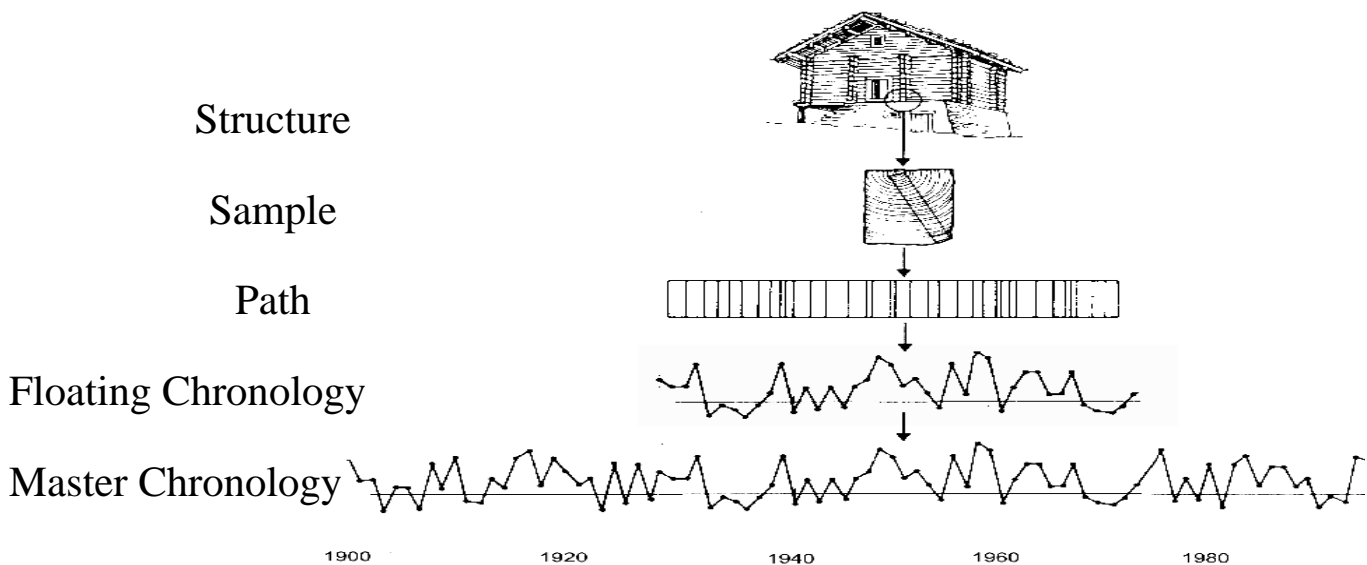

Figure 2 - Example of cross-dating by using patterns from a structure (floating chronology) compared to the master chronology to establish a time line for the sample.

Results and Discussion

Both samples were able to be cross-dated. The correlation of the floating chronology from between the samples is 0.472 (Table 1, Figure 3). The floating chronology locked into time from 1773 to 1854 against the master regional red spruce chronology (Figure 4). The samples were approximately 80 years old, even though sample 08BES001 (Figure 1A) is less than half the size of sample 08BES002 (Figure 1B). Sample 08BES001 has a cut date of 1855 while sample 08BES002 is from two years earlier in 1853.

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Table 1. Sample identifier, path, number of years in the chronology, time span, interseries correlation against the master, presence of worm wood and presence of rot,.

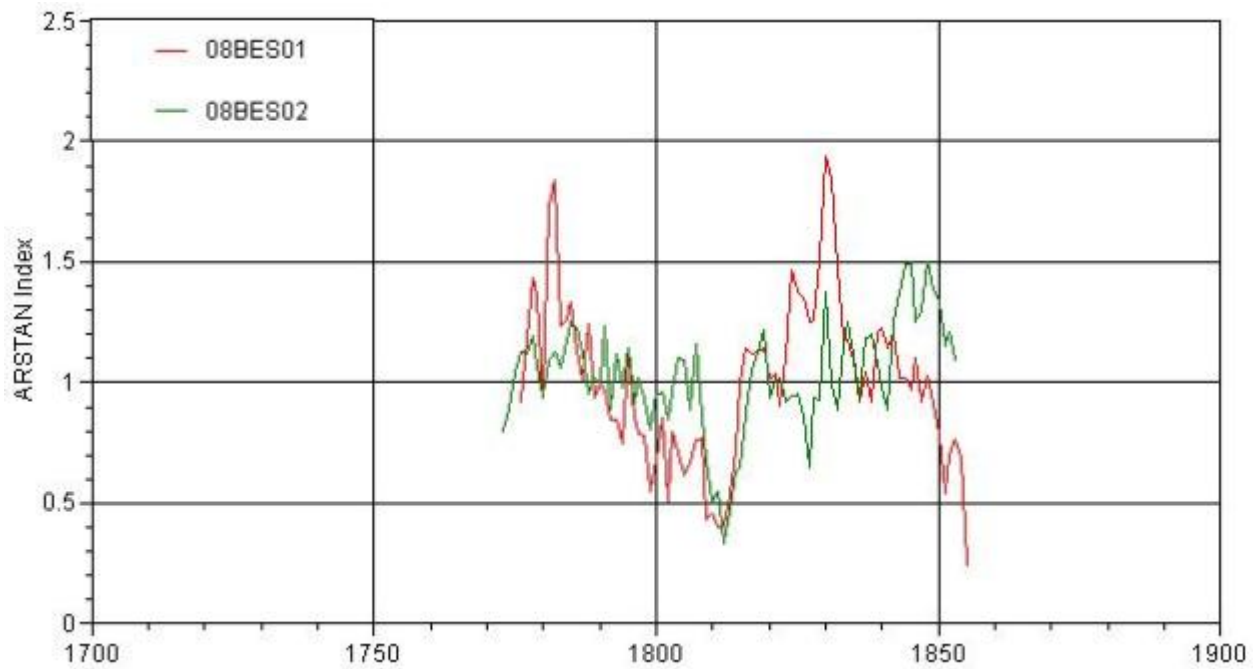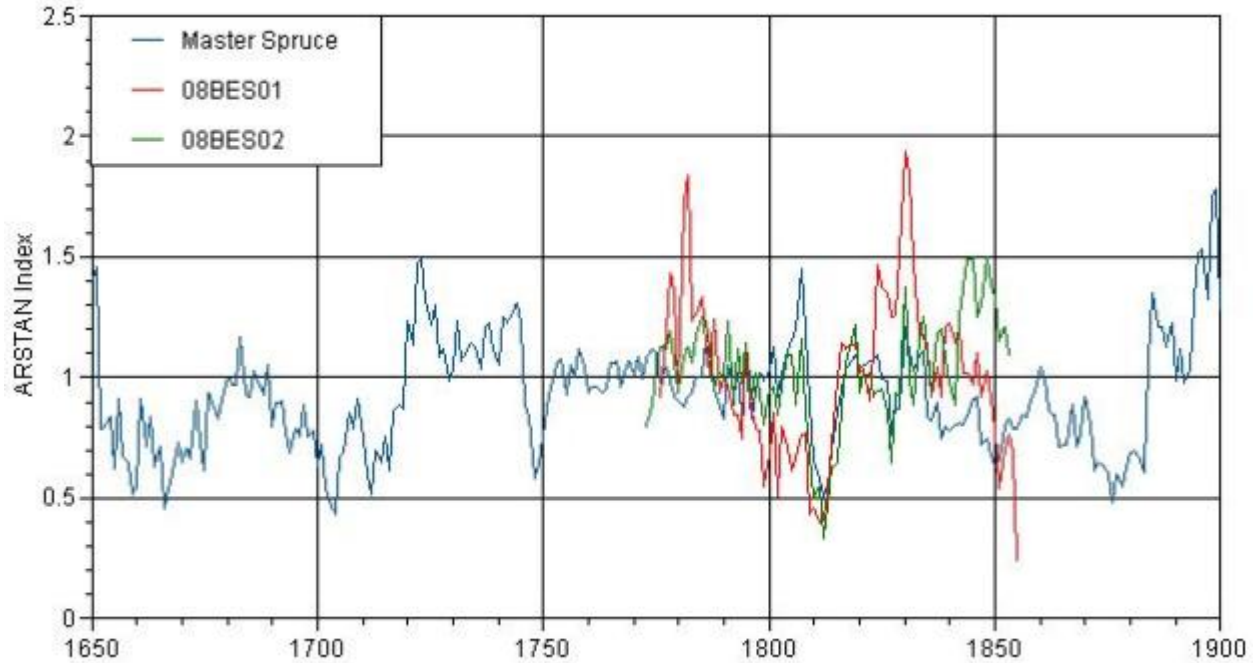| Sample	Path #	Years	Length	Correlation	Worms	Rot
08BES01	A	79	1776-1854	0.483	None	None
	B	80	1776-1855	0.458	None	None
08BES02	A	80	1773-1852	0.533	Slight	None
	B	81	1773-1853	0.460	Slight	None

Figure 3 - Chronologies of sample #1 and #2.

Figure 4 - Chronologies of samples #1 and #2 vs the master regional red spruce chronology.

Conclusions

The two samples from the MacKinnon House are determined to be spruce and were cut within two years of each other. Sample 08BES002 was cut earlier in 1853 and sample 08BES002 was cut after in 1855. Construction of the house was probably with a year of the samples.

References

Holmes, R.L. (1986a). Users manual for program COFECHA. In *Tree-ring chronologies of western North America: California, eastern Oregon, and northern Great Basin* (eds R.L. Holmes, R.K. Adams & H.C. Fritts), pp. 41-49. Laboratory of Tree-Ring Research, University of Arizona, Tucson.

Holmes, R.L., Adams, R.K., & Fritts, H.C. (1986b) Users Manual for Program ARSTAN. In *Tree-ring chronologies of western North America: California, eastern Oregon, and northern Great Basin* (eds R.L. Holmes, R.K. Adams & H.C. Fritts), pp. 50-65. Laboratory of Tree-Ring Research, University of Arizona, Tucson.